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ABSTRACT

This document contains 11 papers: "Integrated English/Keyboarding Instruction: Potential for Contextual Learning" (Baker, Anderson-Yates); "Incorporating Industry-Based Skill Standards into High School Secretarial and Administrative/Information Services Programs" (Bunn, Schmidt, Stewart); "The Effect of Two Different Interfaces for Database Applications on Problem-Solving Activities" (Chen); "The Importance of Workplace Basics Competencies (SCANS) as Perceived by Beginning Business Teacher and Experienced Business Teachers" (Echternacht, Yang); "Word Processing Competencies" (Gatlin, Rogers, Kordsmeier); "Electronic Mail: Attitudes and Effective Writing" (Kandies, Schmidt); "A Foundation Skill: Composing at the Keyboard" (Joyner, Arnold, Schmidt, White); "Electronic Mail: Privacy and Ethical Issues" (Morse, Bialac, Kalishman); "The Effect of Structured Techniques on Group Decision-Making in the Undergraduate Business Communication Classroom" (Neal, Echternacht); "Analysis of Content and Research Design in the 'Delta Pi Epsilon Journal' and the 'NABTE [National Association of Business Teacher Educators] Review'" (Stitt-Gohdes); and "The Effect of Experience on Financial Causal Knowledge in Auditing" (Vaatstra, Blommaert, Boshuizen, Schmidt). Each article contains references. (KC)

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AERA

BUSINESS EDUCATION AND INFORMATION SYSTEMS RESEARCH

SPECIAL INTEREST GROUP

PROCEEDINGS

American Educational Research Association

1995 Annual Meeting
San Francisco, CA

April 18-22, 1995

BEST COPY AVAILABLE

Donna H. Redmann,
SIG Program Chair and Proceedings Editor
Louisiana State University

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NOTES FROM SIG PROGRAM CHAIR

The 1995 American Educational Research Association (AERA) Annual Meeting was held in San Francisco, April 18-22. The theme for the AERA Conference was grounded in growing acceptance of the need for interdependence among the human service professions (e.g., education, social work, school psychology, public health administration) in order to effectively serve children, adults, and families in America. The 1995 AERA Annual Meeting focused on pioneering research and scholarly efforts associated with interdisciplinary partnerships and the resulting interprofessional collaboration.

The AERA Business Education and Information Systems Research Special Interest Group (SIG) had three sessions: two paper presentation sessions, one round table session, and a business meeting. A copy of the SIG program agenda is provided on page v. The 12 papers presented at the conference were selected through a blind, peer refereed process. There were a total of five reviewers, with each proposal being read by two reviewers. The 11 papers contained herein are from authors who wished to have their papers published in this Proceedings and also submitted them within the designated time frame.

Donna H. Redmann

Donna H. Redmann, Program Chair and Proceedings Editor
Business Education and Information Systems Research SIG
1995 AERA Annual Meeting

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Business Education and Information Systems Research SIG Program
1995 AERA Annual Meeting
San Francisco, California
April 18-22, 1995

Session Title: **Curriculum Issues in Business Education and Information Systems Research**
ID No.: S-15-2 -- Sesson No. 1.45

Date/Time: Tuesday, April 18, 12:00 noon - 1:55 p.m.
Location: Parc 55, Aragon Room, 3rd Floor

Chair: Donna H. Redmann, Louisiana State University
Discussants: Ken Martin, University of Cincinnati; Charles R. Hopkins, University of Minnesota

Participants:

The Effect of Structured Techniques on Group Decision-Making in the Undergraduate Business Communication Classroom. Joan Neal, Central Missouri State University; Lonnie Echternacht, University of Missouri-Columbia

The Effect of Two Different Interfaces for Database Applications on Problem-Solving Activities. Catherine S. Chen, University of Minnesota

Incorporating Industry-Based Skill Standards into High School Secretarial and Administative/Information Services Programs. Phyllis C. Bunn, B. June Schmidt, Daisy L. Stewart, Virginia Polytechnic Institute and State University

The Importance of Workplace Basics Competencies (SCANS) as Perceived by Beginning Business Teacher and Experienced Business Teachers. Lonnie Echternacht, University of Missouri-Columbia; Ling-Yu Melody Wen Yang, National Chang-Hua University of Education, China

Electronic Mail: Privacy and Ethical Issues. Glynna E. Morse, Richard N. Bialac, Georgia College; Anthony Kalishman, University of Florida

Electronic Mail: Attitudes and Effective Writing. Jerry Kandies, Delta State University; B. June Schmidt, Virginia Polytechnic Institute and State University

Session Title: **Membership Meeting and Presentations**
ID No.: S-15-1 -- Session No. 22.08

Date/Time: Wednesday, April 19, 6:15 p.m. - 7:45 p.m.
Location: Hilton, Union Square 12, 4th Floor

President: Donna H. Redmann, Louisiana State University
Secretary: Wanda L. Stitt-Gohdes, University of Georgia

Discussant: Judy J. Lambrecht, University of Minnesota

Participants: Intergrated Keyboarding Instruction: Potential for Contextural Learning. Clora Mae Baker, Marcia A. Anderson-Yates, Southern Illinois University at Carbondale

A Foundation Skill: Composing at the Keyboard. Randy L. Joyner, Vivian O. Arnold, East Carolina University, B. June Schmidt, Virginia Polytechnic Institute and State University

An Analysis of Research in Business Education. Wanda L. Stitt-Gohdes, University of Georgia

Session Title: **Roundtables in Business Education and Information Systems Research**
ID No.: S-15-3 -- Session No. 25.32

Date/Time: Thursday, April 20, 8:45 a.m. - 9:25 a.m.
Location: Hilton, Plaza Ballroom, Lobby Level

Participants: A Comparison of Learning Style & Computer Attitudes of Students Enrolled in Information Processing. Ralph Ruby, Jr., Paula D. Ladd, University of Central Arkansas

The Effect of Experience on Financial Causal Knowledge in Auditing. Rina F. Vaatstra, University of Limburg, The Netherlands

Word Processing Competencies. Rebecca Gatlin, Betty Rogers, University of Central Arkansas

PAPERS

PRESENTED

INTEGRATED ENGLISH/KEYBOARDING INSTRUCTION: POTENTIAL FOR CONTEXTUAL LEARNING

Dr. Clora Mae Baker, Assistant Professor
Dr. Marcia A. Anderson-Yates, Associate Professor
Department of Workforce Education and Development
Southern Illinois University
Carbondale, IL 62901-4605
618/453-3321

Using theoretical literature on contextual learning, this study analyzed the effect on basic English skill development when specialized English exercises are integrated into beginning keyboarding instruction. Does completion of an introductory keyboarding course with special emphasis on English exercises influence students' English skill development? Using a meta-analysis of research completed over the past 60 years, the researchers found consistent correlation between English skill development and keyboard learning.

Subjects for the study were 1,243 beginning keyboarding students taught by 22 instructors in 19 high schools. A pre/posttest covering spelling, punctuation, capitalization and word usage was developed and administered to control and experimental groups. Data indicated that the experimental group with integrated instruction outperformed the control group supporting benefits of contextual learning.

Introduction

Over the past two decades, changes in America's economy and its position in the international economic system have focused attention on the way American education prepares young people for work. In response to the country's declining economic competitiveness, the poor performance of our students on international achievement tests, and complaints from business and military leaders about the lack of basic skills among high school graduates, the U. S. Department of Education called for education reform in the early 1980s. Part of the reform effort focused on benefits of integrated instruction and the notion that teaching should be offered "in context," that is, education that enables students to relate schoolwork to the world outside of school is a more effective pedagogical approach than traditional education, with its emphasis on knowledge for its own sake.

The 1993 National Assessment of Vocational Education indicated a lack of systematic evidence that integrated academic/vocational education in schools is effective, in part because not much systematic research has been conducted. It is still too early to assess the effectiveness of integrated education in terms of academic and employment outcomes. However, there is evidence that "contextualized learning" is a more effective pedagogical approach than traditional education.

Two logical instructional content areas for contextual learning and integrated instruction are English and keyboarding. Virtually all students are required to take English courses, and an increasing number of schools are recognizing the value of keyboarding as general education in

this technological society. When writing instruction is addressed, part of the focus is on conventions of written English--word usage, punctuation, spelling, capitalization. While these conventions reflect writers' needs to express themselves more clearly in written form, they are often treated as a separate set of skills--to be taught, learned, and tested.

"Have American students mastered the mechanics?" is a continuing question. Results of the 1984 National Assessment Educational Progress (NAEP) Writing Assessment suggested there have been no dramatic changes over time--for better or for worse--in control of the conventions of written English (Applebee, Langer, & Mullis, 1987). Typewriting textbooks address English language rules in a basic fashion; however, there has been little emphasis on systematically building English skills (word usage, punctuation, spelling, capitalization) in a contextual learning environment through indepth analysis of theory and practice using that theory in typewriting/keyboarding instruction.

Objectives

This study's objective was to analyze the effect on basic English skills develop- ment when specialized English exercises are integrated into beginning keyboarding instruction. The problem of this research was: Does completion of an introductory keyboarding course with special emphasis on English exercises influence students' English skills development? One research question was addressed: Is there a statistically significant difference between the experimental and control groups' posttest score after statistically controlling for their pretest score?

Theoretical Framework

Carnevale (1991) criticized the current education system indicating that "American schooling sequesters students from the real world, by breaking knowledge down artificially into theoretical disciplines, commanding that students commit fragments of knowledge to memory, with application reserved for pen-and-paper exercises at the end of chapters." Similar criticisms have been voiced by many others and focus on the fragmentation of the educational process and its lack of attention to the context and integration of the learning experience (Edling, 1993).

Berryman (1991) commented through a more formal, research-based analysis of traditional beliefs about the teaching/learning process that have been found to be incorrect. Wrong assumptions about learning include "that people predictably transfer learning from one situation to another; that learners are blank slates on which knowledge is inscribed; that skills and knowledge, to be transferable to new situations, should be acquired independent of their contexts of uses."

The ability of students to transfer learning from one situation to another is in itself a skill that must be learned. The focus in the education system has been largely on learning of factual information without much focus on application of that information. Research shows that learning requires active participation on the part of the learner and very little learning occurs if students are treated as passive receivers of information. The human brain is a very contextual device that requires an opportunity to place new knowledge in a context or relationship to other information that has been learned. Learning is greatly strengthened if concrete examples of situations familiar to the student can be brought into play in the learning process (Edling, 1993).

Connecting English skills development and typewriting instruction received research attention beginning some 60 years ago when Wood and Freeman (1932) found consistent evidence that the typewriter's influence on spelling was more favorable than on any other subject tested. Subsequent studies by at least 15 researchers, including Bartholome (1968), indicated typewriting instruction had positive effects on language arts skills. Other authors articulate the absolute need for business personnel to be highly competent in grammar, punctuation, spelling. Ober (1984) mentioned that no matter how competent a student's typing skills, a student who cannot follow standard rules of grammar and style will not be successful. Davis and Gonzenbach (1986) quote Morrison (1985) who said that "a thorough mastery of grammar, punctuation, capitalization, . . . as well as sentence structure and parallel construction is absolutely necessary." Balajthy (1987) and Toppe (1991) stated that a long history of research evidence suggests that proper instruction in keyboarding skills can improve students' reading, language composition, spelling, vocabulary, creative writing, and proofreading.

Data Source/Methods/Techniques

Subjects for the study were 1,243 students enrolled in beginning semester keyboarding classes taught by 22 instructors at 19 southern Illinois high schools. Once approvals to conduct the research were received, instructors and their classes were assigned to either control or experimental status, and teachers agreed to conduct the class according to the assigned group status. All instructors used the same introductory keyboarding textbook.

A pretest/posttest instrument was developed using a format similar to that used in the PSI Basic Skills Test (1981). Forty questions covering spelling, punctuation, capitalization, and word usage were devised and pilot tested using 41 high school students not in the research groups. Using the Cronbach Alpha Reliability Coefficent, the internal reliability was calculated at .94.

Students in the control and experimental groups took the English skills pretest during the first week of keyboarding instruction and completed a data form including basic personal demographic data. Students in the control group received keyboarding instruction in the normal format as identified by each instructor. Experimental group students were taught keyboarding in the normal fashion, but teachers integrated extra basic English skills instruction for 8 weeks after students had learned the keyboard. Supplemental English exercises and periodic reviews, developed by the researchers, were sent to teachers of the experimental group, and they were asked to spend about 10 minutes every alternate day to discuss rules and examples of English use, punctuation, spelling, and capitalization. Short exercises were completed as homework assignments. During the last week of instruction, teachers of both groups were instructed to administer the posttest. Posttest and pretest scores were matched. Some results could not be used because of incorrect identification coding or missing data. As a result, 506 sets of student data were used for the experimental group, and 519 sets of data were used for the control group, or 1,025 total subjects.

Results/Conclusions

Subjects included 575 (56.4%) females and 444 (43.6%) males (6 unknown). Among the ethnic groups represented by subjects, over 90% were white. Subjects were enrolled primarily in grades 9 and 10 (74.6%). The control group score mean for the 40-question pretest was 17.94 (lowest score was 3 and highest score was 35) and 19.08 for the posttest (lowest score was 5 and highest score was 37). The experimental group score mean for the pretest was 19.04 (lowest score was

5; highest score was 37) and 20.968 for the posttest (lowest score was 5; highest score was 38). Using a general linear models ANCOVA procedure, least square means for the control group was 19.52 and for the experimental group was 20.52, a statistically significant difference.

Data show that the experimental keyboarding student group with integrated instruction in English basics outperformed the control group, in response to Research Question 1. Even though the difference between the two mean scores appears small, scores for over a thousand students show a possible profound effect on student English skill development.

Educational Importance

Integrated English/keyboarding instruction provides potential for effective contextual learning. The mechanics of writing, including spelling, capitalization and punctuation, relate to the understanding of language and grammar, because these mechanics are signals that help the learner understand written communication. What better way to enhance those signals than through introductory keyboarding instruction when the learner is intently focusing on the English words?

However, the mechanics of grammar, spelling, capitalization, and punctuation are not ends in themselves. Coupled with command of keyboarding, these mechanics should be the basis for effective communication. The next logical step is to use the English mechanics/keyboarding foundation to compose effective business documents. All students need many opportunities to use their language in meaningful context.

English and business instructors are challenged to work together to develop curriculum that will maximize learning in both instructional areas and to provide transfer of learning opportunities. Keyboarding textbook publishers must provide a leadership role in providing English skill exercises to be used in instruction and in homework assignments.

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INCORPORATING INDUSTRY-BASED SKILL STANDARDS INTO HIGH SCHOOL SECRETARIAL AND ADMINISTRATIVE/ INFORMATION SERVICES PROGRAMS

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Imagine --

Regina is waiting for an interview with the personnel representative at a bank headquarters. She has brought a copy of her portfolio, a "Skills Passport" that documents her education and experience related to the position she seeks. She has copies of her credentials, jointly certified by industry and her local community college, where she wants to continue to take courses in computerized accounting and management while she works.

Regina's portfolio includes her high school record and her achievements as a member of FBLA and PBL, the student business education association. It contains evidence of her work preparation and experience through a school-to-work program that provided student internships in a variety of office positions. As a graduate of this program, she received industry certification for demonstrating the foundation skills identified as part of the national voluntary job skills for secretarial, administrative, and other executive support professionals.

Regina's portfolio documents her study at the community college level and her work experience as a receptionist and information processor. Her skills have been assessed and credentialed through a combination of classroom training and on-the-job mentoring and evaluation.

As part of her interview, Regina is interested in learning how she can continue to upgrade her qualifications and what long-term employment opportunities exist for her as an executive support professional. She wants to make a career commitment to a company that recognizes her potential and value and will help her develop her skills.

--Adapted from the American Electronics Association

SIGNIFICANCE

Over the past ten years, the competitiveness of the U. S. economy has been challenged. This challenge has moved business and education leaders in the United States to acknowledge the interdependence between education and the economy, including workforce preparation. A major outcome of this economic challenge has been the development and implementation of occupational standards, including certification of skills and standards (Warnat, 1992). The SCANS (Secretaries Commission on Achieving Necessary Skills, 1991) report defined skills needed for employment. Building on it, business and industry, education, and government leaders have recognized the need to provide worker preparation that addresses current and anticipated occupational workforce needs. Under the Carl D. Perkins Vocational and Applied Technology Education Act of 1990 (U. S. Congress, 1990), matching grant funds have been mandated for implementing voluntary, industry-based skill standards. These matching grants have implications for greater accountability in business and other vocational education programs. Skill Standards are also integrally related to the Goals 2000: Educate America Act (U. S. Congress, 1994) which incorporates policy requirements for ensuring the success of voluntary industry-based skill standards.

Labor Secretary Robert Reich argues that skill standards can aid communication among employers, educators, trainers, and workers regarding specific skill level and needs. He said, "There is a disconnect between the skills people have and the skills the economy requires" (U.S. Department of Labor, 1993). Skill standards identify the knowledge, skill, and level of ability an individual needs to perform successfully in the workplace. They ensure a common, standardized system for classifying and describing the skills needed for particular occupations and the skills possessed by individual workers (U. S. Department of Labor, 1993).

Twenty-two national trade associations and other organizations have received matching grants from the U. S. Departments of Labor and Education to develop and implement national voluntary skill standards and certification in selected trades or industries. The American Electronics Association (AEA, 1994) accepted matching funds and has developed skill standards in three areas. AEA posits that "skill standards provide concrete examples of the skills needed in today's workplace and give employers, workers, educators, and trainers a common language so they can communicate better with each other. Standards can help educators know how and what to teach and give noncollege bound young people realistic, but challenging goals to work toward. Secretarial and administrative/information support services skill standards and skill standards were developed by AEA (see Table 1). They sought to determine what kinds of skills these workers need to be the best at their jobs. Their key purpose was to provide administrative and organizational assistance to internal and external customers. AEA identified the underlying knowledge, skills, and understanding needed to achieve these skills (AEA, 1994). They also specified the following six critical functions as important for secretarial and administrative/information support service workers: (a) identify customer needs and plan work activities; (b) manage, schedule, activities and events to achieve objectives; (c) manage resources; (d) develop, implement, and evaluate work processes and procedures; (e) generate and maintain documents and information; and (f) initiate and facilitate communication.

Table 1: **American Electronics Association Competencies for Secretarial and Administrative/Information Support Services**

Identify customer needs and plan work activities

Identify customer needs
Plan strategy to accomplish work

Manage schedules, activities, and events to achieve objectives

Produce and manage schedules
Schedule and monitor workload
Arrange, coordinate, and support meetings, events, and activities
Plan and coordinate travel arrangements

Manage Resources

Obtain, operate, and maintain office systems
Maintain material resources
Track financial resources
Contribute to management of work group resources

Develop, implement, and evaluate work processes and procedures

Design and develop work processes and procedures
Coordinate and implement work processes and procedures
Monitor, analyze, and evaluate work processes and procedures

Generate and maintain documents and information

Gather data
Draft, review, and finalize documents and information
Duplicate and distribute documents and information
Establish and maintain document and information storage and retrieval system

Initiate and facilitate communication

Receive and transmit information using telephone and electronic communication
Create and maintain effective and productive work relationships
Provide support and service

OBJECTIVE

As other associations accept Perkins matching grants to develop skill standards, they may also develop similar skill standards in the secretarial and administrative/information support service area. Input from business teachers is important so that the currently separate business and education systems become integrated and communication between business and education is facilitated. The need for teacher input guided. It was sought to determine whether and to what extent business teachers incorporate the AEA or similar skill standards into their curricula.

METHODOLOGY

To determine use of AEA skill standards by secondary business teachers, a questionnaire was developed and sent to high school business department chairs in Virginia. High school business department chairs are in a position to be aware of curriculum trends and changes occurring in Virginia high schools. They were asked whether or not each AEA competency and skill standard for the secretarial and administrative/information support area was a part of the business curriculum in the schools where they serve as business department chairs. If the skill standard was a part of the curriculum, the chair was asked to rate on a four point Likert scale, how important the skill standard was in the business program and the amount of emphasis currently given to the standard.

RESULTS

Results of this study provided evidence of the extent to which secondary business teachers use AEA or similar skill standards to help students see the relationship between what they study and learn in the secondary business curriculum and its application to real-world contexts. Table 2 shows the highest and lowest three standards rated for importance by Virginia business department chairs. The table also indicates the percent of reported programs which included these AEA administrative support skill standards in the high school business education programs. As interpreted by the business department chairs, 91.4% of the programs included "Initiate and Facilitate Communication, Create and Maintain Effective and Productive Work Relations." They also reported that this was the AEA skill standards of most importance, men of 3.71 on a scale of 1 to 4, in their high school business programs. The Virginia business department chairs placed least importance on "Manage Schedules, Activities, and Events to Achieve Objectives, Plan and Coordinate Travel Arrangements" with it having a mean of 2.61 and being included in only 57% of their programs.

Table 3 also includes the percent of programs which include these skill standards in their business program as reported by the department chairs. Table 3 also shows the means given for the three skill standards rated the highest and lowest emphasis of the highest

Table 2. **Importance of AEA Administrative Support Skill Standards Included Included in High School Business Education Programs**

Highest Rated Three Competencies	Mean	SD	Percent[a]
Initiate and Facilitate Communication			
create and maintain effective and productive work relationships	3.71[b]	.73	91.4
Generate and Maintain Documents and Information			
draft, review, and finalize documents	3.56	.77	93.5
Initiate and Facilitate Communication			
receive and transmit information using telephone and electronic communications	3.40	.99	69.8
Lowest Rated Three Competencies			
Manage Schedules, Activities, and Events to Achieve Objective			
plan and coordinate travel arrangements	2.61	.93	57.0
Manage Resources			
track financial resources	2.68	1.06	48.3
Develop, Implement, and Evaluate Work Processes and Procedures			
design and develop	2.75	1.02	54.8

[a] Percent of business programs in Virginia which include the competencies
[b] Rated on a scale of 1 to 4 with 4 indicating a great deal of importance

Table 3. **Emphasis AEA Administrative Support Skill Standards included in High School Business Education Programs**

Highest Rated Three Competencies	Mean	SD	Percent[a]
Generate and Maintain Documents and Information			
draft, review, and finalize documents	3.35[b]	1.09	93.5
Initiate and Facilitate Communication			
create and maintain effective and productive work relationships	3.29	1.10	91.4
Generate and Maintain Documents and Information			
gather data	2.71	1.29	86.0
Lowest Rated Three Competencies			
Manage Resources			
track financial resources	1.62	1.44	48.4
Manage Schedules, Activities and Events to Achieve Objectives			
arrange, coordinate, and support meetings	1.68	1.40	52.7
Manage Schedules, Activities, and Events to Achieve Objectives			
plan and coordinate travel arrangements	1.70	1.28	57.0

[a] Percent of business programs in Virginia which include the competencies
[b] Rated on a scale of 1 to 4 with 4 indicating a great deal of emphasis

and lowest. The department chairs indicated that Virginia high school business programs gave the most emphasis to "Generate and Maintain Documents and Information, Draft, Review, and Finalize Documents." They reported that 93.5% of Virginia high school business programs include this competency. It had a mean value of 3.35, with ratings assigned on a scale of 1 to 4. The competency given the least emphasis was "Manage Resources--Track Financial Resources" which was included in only 48.4 percent of the high school business programs.

CONCLUSION

One conclusion of the study was that although business programs in Virginia include AEA or similar skill standards, the programs could be strengthened through better incorporation of some of AEA and similar skill standards. Those standards which should receive more emphasis include "Manage Resources--Track Financial Resources;" "Manage Schedules, Activities, and Events to Achieve Objectives--Arrange, Coordinate, and Support Meetings;" and "Manage Schedules and Activities, and Events to Achieve Objectives--Plan and Coordinate Travel Arrangements." Further, high school business programs need to give more importance to the following critical functions of administrative/information systems support occupations: (a) "Manage Schedules, Activities, and Events to Achieve Objective--Plan and Coordinate Travel Arrangements;" (b) Manage Resources--Track Financial Resources;" and (c) "Develop, Implement, and evaluate Work Processes and Procedures--Design and Develop." Emphasizing and placing importance on these standards will help students gain the skills needed to meet business and industry entry-level requirements. Entry-level workers would be better prepared to succeed in secretarial and administrative/information support occupations. Incorporation and assessment of these skills would set the stage to certify skills that can transfer from one type of employment to another. These procedures would help students communicate more effectively to future employers what they know and can do that matches the job requirements.

Incorporation of these skill standards will help business educators to develop appropriate curriculum and programs; to understand work-readiness skills that high school graduates need for employment; to join forces with industry to speak a common language about educational needs; to strengthen their relationship with local businesses; and provide students with better career advice. Placing importance and emphasis on industry-based skill standards will also enable business educators to market their programs more effectively because they will be able to assure that their students meet standards. Business teachers will also be better able to communicate with students and parents about how education meets employer needs.

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THE EFFECT OF TWO DIFFERENT INTERFACES FOR DATABASE APPLICATIONS ON PROBLEM-SOLVING ACTIVITIES

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The development of computers and the ensuing information revolution have made a great impact on our society during the past 20 years. Provenzo (1986) stated that "the microcomputer has laid the foundation for a revolution in thought and communication--one that will provide a post-typographic society with a radically new means by which to master information and ideas" (p. 8). This is particularly true in today's complex and competitive business world. The ability of organizing information to be useful for decision making is essential to survive and thrive in an information-based society (Hunter, 1983). Research showed that the complexities of conducting business make the hiring of employees who are capable of thinking through a process most imperative (Morrison & Morrison, 1989). Therefore, one of the objectives in today's business education curriculum is to prepare students to be able to manage, control, and effectively use information for problem solving (Hosler, 1988; D'Onofrio, 1990; Luke, 1989; Maxam, 1990).

Instruction in problem solving generally emphasizes well-structured problems for which information needed is clearly presented and an appropriate algorithm is available that guarantees a correct answer (Frederiksen, 1984; Newell & Simon, 1972). Sternberg (1985) criticizes this approach for not preparing students to be able to solve problems outside of academic settings. As stated by Thomas and Litowitz (1986), most problems faced in life are the ill-structured type of problem for which information needed for the solution is not explicitly identified, the goal is often not specified, and no test exists to determine whether a proposed solution is a solution. To solve this type of problems, individuals must continuously search for relevant information to identify the problem, formulate hypotheses, ask for additional information, and revise hypotheses on the basis of new information until a solution is proposed (Frederiksen, 1984; Thomas & Litowitz, 1986). It appears that when problems are ill-structured, skill in retrieving relevant information becomes more important, along with reasoning skill which is needed in evaluating the evidence for and against each hypothesis. A problem solver, therefore, needs quick access to information that is already available in order to generate and test hypotheses.

In searching for tools that will assist students in the process of problem solving, educators found that microcomputer applications can be used as an organizational/ memory tool to gather relevant information, to sort the information in the way likely to produce solutions, and therefore, to help development of students' own problem-solving strategies (Steinberg, Baskin, & Hofer, 1986; White, 1987). The capabilities of data sorting and searching that database applications provide can be used to group and organize information into chunks, and by breaking a large problem into component problems of the type that a computer can solve, students can more efficiently solve a large problem (Yates & Moursund, 1988-89; Voss & Post, 1988). Database applications, therefore, can be used as an effective tool for providing students with activities that develop problem solving and thinking skills (Parker, 1986). To shape the computer into a truly useful medium, the interactive system should almost disappear and enable users to concentrate on their work (Fischer, 1989; Shneiderman, 1987). In fact, if

users cannot communicate effectively with an interactive system, its computational ability may be inaccessible (Hix, 1989).

In order to teach thinking skills, instructors need information on how students plan, monitor, and evaluate their own problem-solving (Baron, 1987). Yet, little is known about the information processes that students apply while solving ill-structured business problems (Roblyer, 1985). Until a clear understanding of the thinking processes students apply while using microcomputers to solve ill-structured business problems is available, business educators are limited in helping students develop problem-solving ability and in integrating microcomputers in teaching higher-order thinking skills. Therefore, this research was designed to examine the thinking processes that students employ when using database applications to solve ill-structured business problems, and to compare the effect of different human-computer interfaces, if any, on students' thinking processes. Specifically, the study focused on investigating four questions:

1. What are the problem-solving methods students employed in solving ill-structured business problem? Do different human-computer interfaces affect problem-solving methods?

2. Do students possess sufficient database application knowledge to solve ill-structured business problems? Do differences exist in the adequacy of students' knowledge in using a command language interface and using a menu selection interface?

3. What are the computer problems which affect the processes of solving ill-structured problems and/or the decisions made?

4. Is a command language interface or a menu selection interface a more effective tool in assisting problem solving?

The results of this study provided insights on students' problem-solving processes; in turn, the results helped instructors identify students' difficulties and needs. This study also provided needed information to answer the question of the role human-computer interfaces play in solving ill-structured business problems.

Literature Review

Problem solving in cognitive psychology and with respect to the human-computer interface are the two major concerns in this study. The review of information processing theory, the importance of domain knowledge, problem solving processes and methods, the use of computer applications as cognitive tools and their potential in enhancing human problem solving, and concerns and factors related to the human-computer interface are discussed.

Information processing

In recent theories, problem solving has been characterized as information processing, and memory has been given an important role (Ernst & Newell, 1969). Most cognitive psychologists distinguish at least three kinds of memory: a sensory buffer, a long-term memory, and a short-term or working memory. The short-term memory contains the information that is actively being used from both the sensory buffer and the long-term

memory. Information processing consists of controlling the flow of information by retrieving information from long-term memory and receiving information from the sensory buffer; by recognizing, comparing, and manipulating symbols in short-term memory; and by storing information in long-term memory (Shiffrin, 1975). Thus short-term memory maintains an internal representation of the current situation. Its capacity, however, is limited to five to seven items of information (Miller, 1956; Simon, 1974). Information may be lost through decay or displacement. Based on the assumption that the processes and information compete for a shared limited capacity, a task that has heavy processing requirements should decrease the amount of additional information that can be maintained. Since short-term memory is capable of holding a small amount of information, it represents a fundamental limitation of human mental capacity (Anderson, 1985; Miller, 1956). Fortunately, cognitive psychologists believe that the capacity of short-term memory can be greatly increased by chunking (Battig & Bellizza, 1979; Miller, 1956; Tulving, 1962). The process recodes concepts and relations into higher order units, so that a single concept of symbol represents a collection of related items of information (Chi, Glaser, & Rees, 1981). Yet, the process of forming rich chunks would temporarily strain short-term memory capacity because the prerequisite for chunking is that each of the individual concepts be present simultaneously in short-term memory (Schneider & Shiffrin, 1977).

Domain Knowledge

In the cognitive research movement in the 1960s and 1970s, it was believed that it would be possible to teach generic higher-order thinking processes that would be applicable to any problem or situation. As more research has explored the question of generic thinking processes, it has become increasingly evident that there is a close relationship between thinking processes and a well-developed knowledge base (Greeno, 1980; Nickerson, 1987; Simon, 1980). Knowledge in a particular area is referred to as domain knowledge, which includes declarative and procedural knowledge one possesses relative to a particular field of study. Declarative knowledge refers to knowing about things, facts, concepts, and interrelations that can be verbally communicated or held in mental models. Know how, which is procedural knowledge, refers to the skills of knowing how to perform (Anderson, 1983, 1985; Bourne, Dominowski, & Loftus, 1986; Gagne, 1985). Declarative knowledge requires recall or recognition and tends to be relatively static; procedural knowledge is more dynamic and subject to transformation which requires individuals to reconstruct new knowledge (Anderson, 1983; Gagne, 1985).

There are two types of domain knowledge needed in this study: the knowledge of business and microcomputer skills. To be able to construct a problem representation, to search for solutions, to judge the relevance of data, and to evaluate the importance of a solution in relation to the goal of the problem-solving processes, students need to have a broad sense of the domain knowledge in business. Secondly, it is necessary for the problem solver to acquire needed microcomputer skills to be able to use microcomputers as tools to enhance problem solving. The knowledge of using a microcomputer is initially encoded as declarative knowledge, which is a set of facts about computer operations. To efficiently utilize the tool, however, one must apply general problem-solving procedures to interpret the declarative knowledge and create problem-specific rules; then these rules can be structurally mapped onto new problems and used to solve new problems (Kay, 1991).

Problem Solving Processes and Methods

The concepts of task environment and problem space are important to Newell and Simon's (1972) human problem-solving theory. The task environment "refers to an environment coupled with a goal, problem, or task" (p. 55); therefore, it is the structure of facts, concepts, and their interrelationships that make up the problem. The problem space refers to the problem solver's mental representation of the task environment in which problem-solving activities take place. The solving of a problem involves proceeding through five stages: a)constructing an internal representation of the task environment; b) selecting a method for solving the problem; c) implementing the method; d) attempting another method, reformulating the problem, or terminating the attempt to solve the problem; and e) selecting another method if new subgoals emerged. However, Newell and Simon (1972) suggested that the problem-solving process does not progress in a linear fashion. To solve a problem, the problem solver's behavior will be "consisting of repeated loops around a circuit: select a goal-->select a method-->evaluate the results-->select a goal again" (p.90).

Based on Newell and Simon's problem representation and problem space concepts, Anderson (1985) described problem solving in terms of searching a problem space which consist of various physical states or knowledge states of the problem. Starting from the initial state, there are various ways the problem solver can choose to transform the initial states into a goal state. Problem solving is the behavior directed toward achieving a goal, and goals function to organize knowledge about how to achieve subgoals. Due to the importance of the initial representation, research has shown that an inaccurate problem representation generally does not provide enough preceding knowledge to solve a problem (Chi, Feltovich, & Glaser, 1981). For relatively complex problems, the solver develops a problem representation and then devises a plan, which includes a solution to the problem and a number of strategies proposed to achieve the solution. The problem solver carries out the plan, and then the results are often evaluated, except in cases where working out the solution is a routine process (Nickerson et al., 1985; Voss et al., 1983).

Sweller (1983) categorized problems into stimulus-response-feedback problems and transformation problems. The transformation requires the transformation of the problem from initial state to goal state, and when the goal state is reached, the problem is solved. The methods of solving transformation problems, which are relevant to this study, include a) algorithms--specific procedures that are guaranteed to produce a solution to a problem so long as the algorithm is relevant to the problem (Anderson, 1985) , b) means-ends analysis--identifying various differences between the goal state and the current problem state with operations that are likely to reduce those differences (Anderson, 1985; Nickerson et al., 1985), c) subgoal analysis--decomposition of the problem into a number of subproblems, and solutions are sought for the subproblems (Sacerdoti, 1977), d) working backward--starting with the goal and trying to change it into the given (Anderson, 1985; Andre, 1986; Wickelgren, 1974), and e) problem solving by analogy--using the structure of the solution to one problem to guide solution to another problem (Nickerson et al., 1985; Bransford et al., 1987).

Microcomputers and Problem Solving

Psychologists have shown that people have limited cognitive resources. Humans can manage only a few items of information at one time, and the relatively unlimited long-term memory is subject to errors. Historically, there have been extensions of human intelligence through the use of cognitive technologies, which Pea (1986) defined as "any medium that helps transcend the limitations of the mind, such as memory, in activities of thinking, learning, and problem solving" (p.6). As discussed earlier, problems that require processing large amounts of information tax the short-term memory resources of the problem solver, particularly is at the same time they are involved in applying problem-solving strategies.

A study by Steinberg, Baskin, and Hofer (1986) indicated that using the computer as an organizational/memory tool to order and store the information was a helpful aid to problem solving. In addition to reducing memory requirements for solving problems, microcomputers can also be used to remove mechanical operations from students and permit higher-order thinking: problem formulation, problem analysis, and solution interpretation (Pea, 1986; Perkins, 1985; Lambrecht, 1993; Schoenfeld, 1988). By providing quick and accurate solutions, microcomputers enable mathematics students to test hypotheses with different variables, to focus on problem formulation and interpretation, and to solve problems of larger and more meaningful size (Heid, 1983). Yerushalmy and Houde (1986) also reported that with a software tool developed to carry out difficult and time-consuming tasks, students were able to focus on problem-solving processes. Students were no longer concerned about the overhead of performing the construction; rather, students could test hypotheses empirically, devise a strategy, and then implement it. In White's (1987) study of the effects of computerized databases in teaching information processing, the results revealed that students who received instruction on problem solving using microcomputers for data manipulation achieved significantly higher mean scores on an information processing test than their non-computer counterparts.

Human-Computer Interface

The two metaphors that describe interaction styles are conversational and model environment. In the conversational environment, the user describes the intention with a command language. On the other hand, the model environment requires the user to show the intention by manipulating visual representations of operations (Hartson, 1989), which include selecting options from menus and directly pointing at visual representations of objects and actions to instruct the machine of the desired procedure (Shneiderman, 1987). Hayes, Ball, and Reddy (1982) criticized that the use of a restricted language designed specially for a particular system is one of the important causes of the human-computer communication barrier. A command language interactive system typically responds only to commands phrased with total accuracy. If the user fails to do so, although simply with a small mistake, the only response that the user gets typically would be an error message. This type of system often fails to understand the user's intention and is unable to explain the nature of the misunderstanding to the user (Hayes, Ball, & Reddy, 1982).

On the other hand, Norman (1984, 1987) argued that there is no perfect design, only tradeoffs. He explained that command language applications offer the expert great versatility.

With a command language system, experts can specify their operations, parameters, files, or other required options directly with commands. For a menu system, the user has to wait for the system to display all available commands before an option can be specified; and if the menu stays on the screen while normal work continues, there will be less amount of room left on the screen for displaying other important information (Norman, 1987). In addition, users of a menu selection system will need to have a comprehensive understanding of all of the options displayed in the menu. Without this knowledge, it will be difficult for the user to select the appropriate option before exploring several options that might seem to have the same functionality.

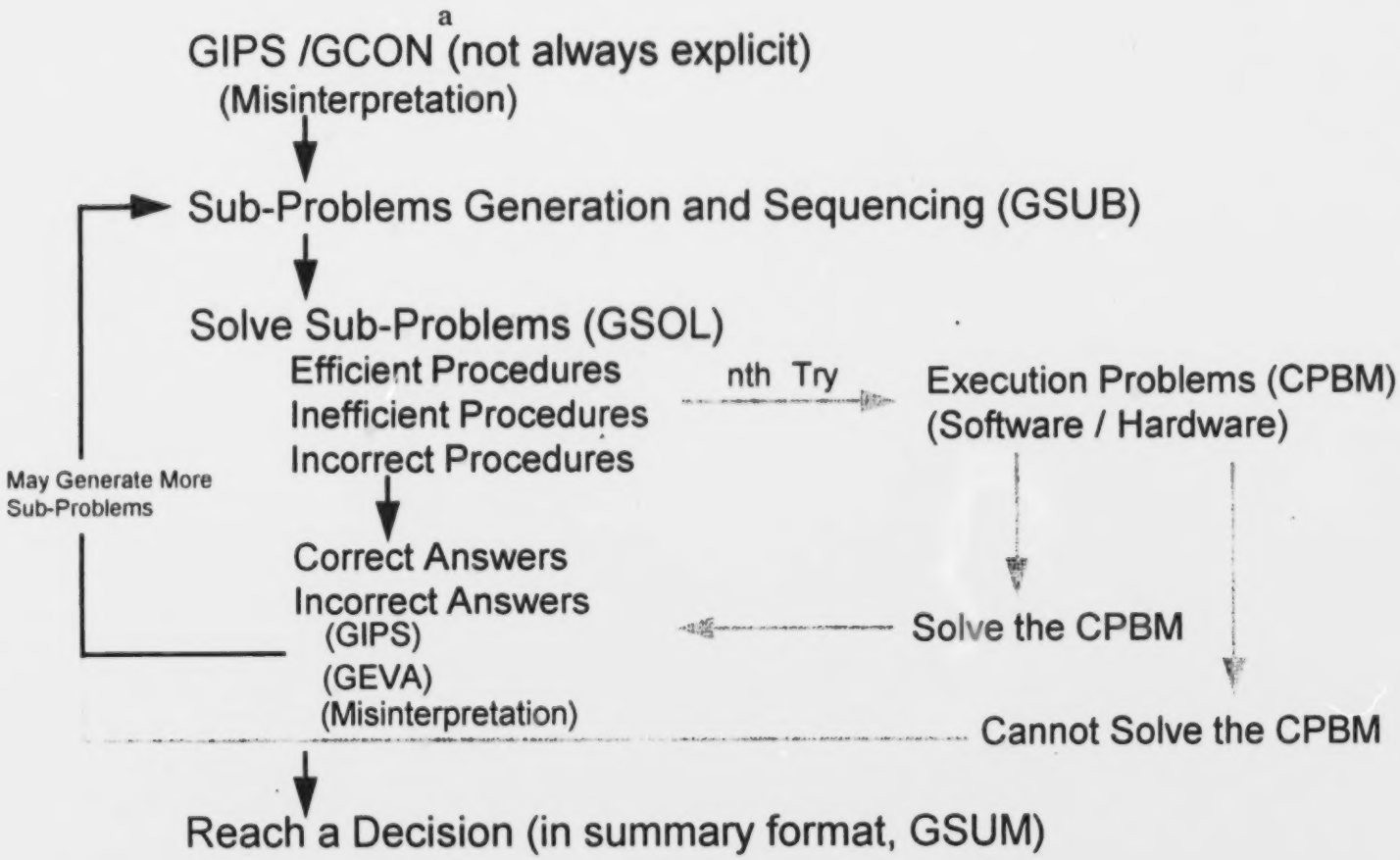
Stages in Human-Computer Interaction

Norman (1984) offered a stages of human-computer interaction model: intention, selection, execution, and evaluation. Intention refers to forming the internal mental characterization of a desired goal; selection involves reviewing possible actions and selecting the most appropriate one; execution is the physical act of entering information into the computer; and evaluation is checking the results of execution and using the results to direct further activity. If the operation cannot be performed, the user will probably maintain the same attention, correct the inappropriate command, and then retry the execution. If the results are incorrect or undesirable, the user may attempt another intention or discard the results (Norman, 1984).

Most command language systems provide no or little support for intention, selection, execution, or evaluation. The user is expected to have the knowledge of using the system. Menu systems, on the other hand, provide interaction aids for intention, selection, and execution stages. For intention and selection stages, menus are capable of presenting the user with a list of alternatives and descriptions of the alternatives. Menu can aid in the execution stage by providing the user with a target to be selected, an abbreviated execution name, or the full command line to be used (Norman, 1984). According to Norman (1984), the two systems differ in the type of errors they lead to and the way they respond. In a command language system, an error in the command used leads to an illegal command, thus, no action is performed. In a menu system, however, an error in specification is almost always a legal command, which makes it difficult for the user to detect the mistake. From an information processing perspective, Shneiderman (1987) commented that "the greatest benefit [of menu selection environment] may be that there is a clear structure to decision making since only a few choices are presented at a time" (p. 59).

Voss et al. (1983) developed a problem solving control structure for their protocol analysis on problem-solving skills in the social sciences. Seven operators were identified: state constraint (GCON), state subproblem (GSUB), state solution (GSOL), interpret problem statement (GIPS), evaluation (GEVA), and summarize (GSUM). This structure has been useful in studying problem solving; however, it is not sufficient in investigating problem solving with microcomputers as tools. To develop a model to describe the cognitive process with microcomputers as tools in this study, Voss et al.'s (1983) goal structure was incorporate with Norman's (1984) four stages of human-computer interaction to form the Computer-Aided Problem-Solving Model (Figure 1). Then, this model was used to analyze collected protocols during computer-supported problem solving.

COMPUTER-AIDED PROBLEM-SOLVING MODEL



[a] GIPS includes interpretation of the problem, data, the use of procedures, or results of executions.

Figure 1. Computer-Aided Problem-Solving Model

Methodology

The data needed to address the intent of this study were gathered through the use of three research approaches during the problem-solving interviews. At the beginning of the interview, a demographic questionnaire was administered to gather background information, including subjects' education and work-related experience in both business employment and on computers. Then, subjects were asked to "think aloud" while solving an ill-structured business problem using microcomputer database applications. When subjects were performing the problem-solving task, syntaxes and procedures used and the computer responses displayed on the screen were recorded as supplemental materials to verify procedures used in the problem-solving activity. The audiotaped interviews were transcribed, coded, and analyzed to identify the cognitive processes employed and database application knowledge possessed.

Subjects

The information processing literature reviewed indicated that domain knowledge is important in problem-solving activities. To be qualified for this study, potential subjects had to a) have formal education or working experience in business; b) have hands-on experience on the use of microcomputers; c) have hands-on experience on using dBASEIII+ or dBASEIV application; and d) have experience on solving ill-structured business problems with a large volumes of computerized data.

After an extensive search, subjects were recruited from a population of students enrolled in Database Applications in Business and Marketing Education at the University of Minnesota. Subjects were selected from this class because generally students enrolled in this class have finished several business courses and have business experience. At the time this study was conducted, students would have received one quarter of instruction on the general usage of computers and one quarter of instruction on using database applications in solving business problems. Twelve of 19 students enrolled in the class participated in the study, and they were randomly assigned to the command language group (dBASEIII+) and the menu selection group (dBASEIV).

Data gathered from the questionnaire administered at the beginning of the problem-solving interview indicated that as a group, subjects in both groups had the similar computer experience and business experience (See Appendix A).

Generation of Instruments

It was essential to select problems that met the following criteria: a) an ill-defined business problem for which there was no single solution and correct answer, b) a business problem which required the use of large volume of computerized data, c) a typical business problem that a college graduate could be expected to solve. To gather problems, a questionnaire was sent to 201 members of the Office System Research Association (OSRA), asking assistance in identifying business problems appropriate for instructional use. Second, visits were paid to two small businesses to gather business problems. Information gathered from these businesses and the problems obtained from the mailing responses were then complied to form 14 ill-

structured business problems. These problems were ranked according to their complexity and the use of database application procedures.

A fictitious corporation (Bits & Bytes Inc.) was created to simulate the database environment of a real business. A consultant with five years of experience managing a microcomputer system department provided assistance in creating the fictitious corporation, the database model, and the database files used in this study. Based on the database design theory presented in Designing Quality Databases with IDEF1X Information Models (Bruce, 1992), a database model was developed with eight database files (See Appendix B). In the process of generating the database files for Bits & Bytes Inc., every effort was made to ensure that the data closely resembled that of a real business.

Research Procedures

Thornburg and Pea (1991) commented, after reviewing several studies, that people choose logical alternatives and use more effective procedures on problems with familiar data. Due to the complexity of the database model of Bits & Bytes Inc. and the large volume of records used in this study, it was essential that students have the opportunity to explore the database model and files. A commercial workbook for business problem solving using microcomputer database applications was used in the first five weeks of the course. At the sixth week, gathered business problems with lower complexity were given to students with two database files. Gradually, students were given less structured problems with higher complexity and more database files to solve.

The Bits & Bytes Inc. database model, all the database files, and the two business problems in the higher complexity rank were piloted with two individuals. Both pilot tests showed that two complex problems would be too lengthy and subjects might not maintain their optimum level of performance if they had to solve two problems consecutively. Since both pilot study participants recommended using the first problem only, the second problem was dropped from the study.

The interview on the problem-solving activity were conducted at the end of the quarter. An office in the Division of Business and Marketing Education was reserved and set up for the interviews. A microcomputer with dBASEIII+ and dBASEIV applications and a LaserJetIIP printer were set up with a U. S. A. national atlas, a calculator, reference books for dBASEIII+ and users' manuals for dBASEIV, notepads, and pencils placed on the desk next to the computer. All 12 interviews took place in the same office with the same setting. Before the command language interviews, a text file in dBASEIII+ was opened to record the keystrokes that subjects would key. Since the text file feature was not available in dBASEIV, the researcher observed and recorded the options that subjects in the menu selection group used and the response displayed on the screen.

the keystroke records and the researcher's observation records were used as supplemental materials to validate subjects' operations.

Findings

Similarity and differences were found between groups of subjects using the command language interface and the menu selection interface.

Problem-Solving Processes

For the purpose of identifying subjects' thinking processes, the flow charts of subjects' problem solving processes were simplified to diagrams, in which lower-level details were eliminated to illustrate a higher-level thinking process (See Appendix C for an example).

Similarities were found in terms of the problem-solving methods used among subjects who used the command language interface and those who used the menu selection interface. Subjects used a top-down subgoal analysis strategy in solving ill-structured business problems. The problem was decomposed into smaller subproblems, and then subproblems were sequentially solved. Subjects tended to adopt the cycle of identifying a subproblem, solving the subproblem, evaluating the results of the subproblem, and then identifying another subproblem. However, if subproblems were not solved immediately, subjects tended to forget about them. The problem-solving cycle continued until a decision had been made and the subjects decided that the problem was solved. The factors which caused the shift of attention away from this cycle included waiting for the execution of results, searching for an appropriate procedure, and the emergence of computer problems.

When subjects encountered computer problems or detected errors in the execution results, the working backward method was used to trace back and check the correctness and completeness of syntaxes used. If errors were not found in the procedures used, subjects traced further back to relevant preceding procedures to locate errors.

Database Application Knowledge

Knowledge includes declarative and procedural knowledge. In this study, the investigation of subjects' declarative knowledge included a)the examination of typographic errors and syntax errors in both command language and menu selection groups, and b) an examination of making incorrect menu selections and losing queries due to pressing the wrong keys by subjects in the menu selection group. To investigate subjects' procedural knowledge, the use of wasteful commands, inefficient procedures, and incorrect procedures were identified and analyzed by frequency counts and differentiated using the Mann-Whitney tests.

Declarative Knowledge. Due to the nature of the interface, subjects in the command language group needed to perform more keyboarding than subjects in the menu selection group. Keyboarding errors can be categorized into "casual' errors and errors caused by the lack of knowledge on the correct syntaxes. Table 1 illustrates the frequency counts of keyboarding errors made by subjects with both the command language and menu selection

interfaces. Among the four types of errors, wrong option, lost query, and typo were in the casual error category.

Significant difference was found among groups using the Mann-Whitney test at $\alpha = .05$ ($\sum R_{xcalc.} = 53$, $n = 6$). Subjects in the command language group appeared to have made more typographic errors than subjects in the menu selection group. The error type that indicated insufficient declarative knowledge was syntax errors. There were significant differences between groups when using the Mann-Whitney procedure in comparing number of syntax errors made ($\sum R_{xcalc.} = 51$, $\alpha = .1$, $n = 6$). Subjects using the command language interface tended to make more syntax errors than subjects using the menu selection interface.

Table 1

Syntax errors made by subjects

Subjects		Wrong [a] Option	Lost [a] Query	Typo	Syntax Error
Command Language	III.1			3	4
	III.2			2	7
	III.3				12
	III.4			2	5
	II.5			1	2
	III.6			2	12
Menu Selection	IV.1	1	1		1
	IV.2	1	2		6
	IV.3	1	1		2
	IV.4		2	1	3
	IV.5				2
	IV.6	1			3

[a] Errors not applicable in the command language group.

Procedural Knowledge. Procedures used by subjects in the problem-solving activity were examined for wasteful commands (the uses of the commands did not serve any purposes), inefficient procedures, and incorrect procedures. The use of commands and procedures in these three categories reflected that subjects did not know "how" to use a particular procedure. Table 2 lists the frequency counts on the demonstration of the lack of procedural knowledge. Subjects in the command language group used a significantly higher number of wasteful commands and procedures than subjects in the menu interface group. The difference existed at a more conservative $\alpha = .02$ level ($\sum R_{xcalc.} = 55$, $n = 6$).

Using the Mann-Whitney rank-sum test, no significant difference was found between groups in using inefficient procedures at the $\alpha = .1$ level ($\sum R_{scale.} = 46.5$, $n = 6$). However, a close examination of protocols and the records of keystrokes used revealed that the inefficient procedures used by subjects in the command language were severe. For instance, subject III.5 printed 105 pages of unnecessary reports due to the use of inefficient procedures. In comparing the use of incorrect procedures, the Mann-Whitney rank-sum test revealed a significant difference at the $\alpha = .1$ level ($\sum R_{scale.} = 50.5$, $n = 6$), which indicated that subjects in the command language group used more incorrect procedures than subjects in the menu selection group during the problem-solving activity.

Table 2

Wasteful commands, inefficient procedures, and incorrect procedures made by subjects

Subject		Wasteful Command	Inefficient Procedure	Incorrect Procedure
Command Language	III.1	2		2
	III.2	1	1	3
	III.3	5	1	1
	III.4	6	6	1
	III.5	9	3	
	III.6	21		2
Menu Selection	IV.1			
	IV.2			2
	IV.3	4	6	
	IV.4			
	IV.5			
	IV.6			

Computer Problems and Problem-Solving Processes

Four computer problems that affected problem-solving processes were identified: complex database procedures, insufficient procedural knowledge, software errors, and undetected errors in execution results. As the complexity of a procedure increases, users are more likely to have insufficient procedural knowledge to apply the procedure in solving problems. Since the complexity of procedures and insufficient procedural knowledge are interrelated, the effects of these two factors are discussed jointly. An examination of all 12 verbal protocols revealed that four of six subjects in the command language group decided not to consider some relevant information in making decisions due to the need to use complex database procedures, abortion of an operation because of the failure to use an efficient procedure, or

failure to recognize that the information was available. None of the subjects in the menu selection group excluded the consideration of any factor in decision making due to the same reasons. Significant difference was found at the $\alpha = .1$ level using the Mann-Whitney rank-sum test ($\sum R_{xcalc.} = 51$, $n = 6$). When software errors prevented a subject from solving a subproblem, the subject examined the syntaxes used in relevant procedures and re-tried the procedures. After several attempts, the subject decided to abort the operation and found an alternative which provided an approximate indication for making a decision.

In solving ill-structured business problems, the ability to detect errors in the answers obtained by any means is essential to making the right decision. All but one subject participating in this study used cross references to confirm that the answers obtained were correct. The subject who did not detected errors in computer results made unreasonable decisions based upon the incorrect answers.

Computers as Cognitive Tools

To answer the question of whether a command language interface or a menu selection interface a more effective tool in assisting problem solving, both quality and quantity of factors all subjects considered are examined and discussed. In addition, an analysis of the factors skipped, the use of wasteful commands, inefficient procedures, and incorrect procedures are discussed in combination with the quality of factors checked to reveal the qualitative differences on the overall problem-solving processes.

Table 3 lists the number of factors for which answers could be obtained with the use of the computer (countable factors) and the number of other factors that were mentioned for which either information was not available or was considered irrelevant.

The Mann-Whitney rank-sum tests revealed that no differences existed between groups in terms of the number of countable factors checked and the number of other factors considered at the $\alpha = .1$ level ($\sum R_{xcalc.} = 33.5$, $n = 6$ for both the countable factor variable and the other factor variable). A close examination of the countable factors checked revealed that fewer subjects in the command language group used large files. As a result, fewer subjects in the command language group had the chance to commit inefficient procedures. Nevertheless, subjects in the command language used a total of 11 inefficient procedures, and subjects in the menu selection group used a total of six inefficient procedures.

An overall examination of the occurrences of typographic errors and syntax errors, the use of wasteful commands, and the use of inefficient and incorrect procedures suggested that subjects in the command language group appeared to be less "on the task". The difference in the interface appeared to affect the focus of subjects' attention. The findings on the errors made and wasteful and incorrect procedures used suggested that computer problems shared more of subjects' attention in the command language group than in the menu selection group.

Table 3

Number of countable factors and other factors considered by subjects

Subject		Countable Factors Checked	Other Factors Mentioned
Command Language	III.1	5	5
	III.2	4	3
	III.3	4	
	III.4	5	10
	III.5	6	3
	III.6	2	4
Menu Selection	IV.1	5	2
	IV.2	4	6
	IV.3	6	5
	IV.4	5	8
	IV.5	4	4
	IV.6	7	5

No differences were found in the quantity of factors that subjects considered before making the decision. However, the difference in the interface tended to affect the qualitative aspect of problem-solving processes. Subjects in the menu selection group appeared to use large files more often, create more links between files, and examine data in a more complex and comprehensive manner. Three of six subjects in the menu selection group linked two large files and examined the data from a more detailed and complex perspective, which generated useful information for solving the second part of the problem. None of the subjects in the command language group examined the data in this fashion.

Conclusions

Based on the findings, the conclusions are described in relation to the four questions that the study investigated: problem-solving methods, application knowledge, computer problems and problem solving, and computers as cognitive tools.

Problem-Solving Methods

The subjects participating in this study used a subgoal analysis method in their problem-solving processes. After the problem representation (implicitly or explicitly), subjects decomposed the problem into subproblems, selected a procedure to solve the subproblem, evaluated the results of the subproblem, and then selected another subproblem. Meanwhile,

subjects interrupted the processing cycle to interpret the problem, database files, or the use of a procedure. The reasons for the interruptions could be that the subjects started constructing a solution plan when the problem text was only partly read and the problem representation was partially completed, or there was too much information to be maintained in the working memory due to the complexity of the problem and/or database files. As a result, subjects needed to go back to either refresh the understanding or re-interpret the related portion of the problem or database files when they focused on a certain subproblem. The data also showed that if subproblems were not solved immediately, the subjects were likely to forget about solving the subproblems. This also indicated that with limited working memory, subjects could not maintain all relevant information in their immediate attention at all times.

This evidence is consistent with the problem-solving theory revealed, which indicated that humans have limited working memory (Hitch, 1978), problem-solving processes are repeated loops (Newell & Simon, 1972; Nickerson et al., 1985) and the problem-solving steps are likely to be overlapped (Greeno, 1973).

Subjects in both the command language group and the menu selection group used the same problem-solving methods and demonstrated the same problem-solving characteristics discussed earlier. One conclusion which can be made from these data is that higher-level problem-solving methods and processes are not affected by the interface. However, the interface affected the quality of the subproblems identified. The reason could be that the use of computers as tools did not come to play until subjects started the process of searching for solutions to solve subproblems. Since the steps of identifying subproblems and searching for solutions could be overlapped or simultaneous, the interface affected the quality and complexity of the subproblems identified. The details of the qualitative effects of the interface on the subproblems identified are discussed in a latter section.

Database Application Knowledge

Subjects in the menu selection group made fewer typographic errors and syntax errors and used fewer wasteful commands, inefficient procedures, and incorrect procedures. From these findings, one conclusion that can be made strongly is that subjects using the menu selection interface possessed more sufficient declarative knowledge and procedural knowledge than the command language group. Although subjects in this group received less instruction using dBASEIV in comparison to the ten-week course on using dBASEIII+, they made fewer syntax errors and were more competent in using the application to solve problems.

One might interpret these findings to mean that an application with a menu selection interface is easier to learn; but caution should be considered in this interpretation. Since the subjects in the menu selection group had received the same instruction on dBASEIII+ for the same period of time as the command language group prior to learning the menu selection version of the application, these findings could be the result of an accumulation of the instruction on both the command language and the menu selection versions of the application. Nevertheless, the findings are consistent with the literature which indicated that with a command language interface, the need to depend on long-term memory recall of the commands and their syntaxes is greater (Olson, 1987); and certainly the dependence on recall of complex syntax rules is bound to lead to more syntax errors.

Computer Problems

It was clear that software errors affected problem-solving processes and the decisions made. A software error can be an unsolvable computer problem, and the user is not at fault. The error was embedded in the software, and the user neither had a way of knowing nor a means of correcting it. Due to the subject's lack of unawareness of the cause and the inability to solve the problem, the subject was confused and frustrated after a few unsuccessful attempts to locate the error. The frustration and the time spent in attempting to solve the unsolvable software error, in turn, caused the subject to withdraw from completing the problem-solving processes.

Another factor which severely affected the decisions made was undetected errors in answers. In using computer applications for problem solving, particularly with a database application, the computer might accept inappropriate syntaxes and respond with incorrect answers without warning; it is up to the user to judge if the answers given are without errors. Most subjects used cross references to check the correctness of the answers. If the answers were incorrect, the decisions which were to be drawn from such answers certainly were unreasonable.

Computers as Cognitive Tools

The data revealed that subjects in the command language group were less likely to use complex procedures to solve subproblems, and as a result, subjects in this group were more likely to skip the consideration of relevant factors for decision making. Only two subjects in the command language group created relations between files and used large files. On the contrary, subjects in the menu selection group were more likely to use large files and create relations for complex procedures. The differences found in the use of wasteful commands, inefficient procedures, and incorrect procedures also indicated that the command language interface distracted from the problem-solving processes by requiring complicated steps in using a procedure and difficult-to-remember syntaxes. Consequently, these detailed, rule-based procedural requirements in using the interface prevented the subjects from examining the data freely and more comprehensively. The evidence demonstrated by subjects in the menu selection group, who linked files more often and gathered information from a more detailed and complex perspective, supports this conclusion.

There are two main domain knowledges involved in solving business problems with computers: knowledge in business and knowledge in using computers. Subjects in the command language group and subjects in the menu selection group received similar education on business subjects and had much the same working experience in business. These similarities might explain why the difference in the interfaces used did not affect the quantity of the factors considered by subjects. Both the quantity and the quality of the factors considered for solving a business problem are dependent upon both the business domain knowledge and computer domain knowledge subjects possessed. Although the interfaces did not affect the quantity of the factors checked, the interface affected the quality of the factors considered.

Implications and Recommendations

From the study results, there are three areas having implications for educational practice. The description of these implications is followed by recommendations for instruction in problem solving.

Focus on practical applications

It is evident that sufficient procedural knowledge is important in the process of solving business problems with microcomputer applications. Although no statistical significance was found in the use of inefficient procedures among subjects with different interfaces, the fact that four of six subjects in the command language group used at least one inefficient procedures did have instructional significance, considering that only three subjects in this group used large files. The high number of wasteful commands, inefficient procedures, and incorrect procedures used in the command language group indicated that without sufficient procedural knowledge, subjects wasted a lot of time and effort in using unproductive commands or procedures. When integrating microcomputers in teaching higher-order thinking skills, students will be handicapped by the lack of comprehensive procedural knowledge on the use of a microcomputer application. Problem-solving activities that allow students to practice real-world problems can assist students in developing strategies for effective use of microcomputer applications.

> It is recommended that instructional approaches focus on the practical application of declarative knowledge to various situations to assist students in developing sufficient procedural knowledge.

Choice of interface

Another area with important implications for education is the area of using microcomputers in enhancing students' mental functioning. The results showed that subjects in the menu selection group were more able to examine data freely and ask questions in a more comprehensive fashion. The differences found in the insufficient procedural knowledge possessed and the number of factors excluded from consideration indicate that the command language interface hindered subjects' intentions in exploring data, gathering relevant information, and examining data from a higher-level perspective. Subjects using this interface seemed to be restricted by the syntax requirements and were unable to free themselves to examine data from various perspectives.

> It is recommended that in integrating microcomputer application in teaching higher-order thinking skills, the interface selected should facilitate exploration and problem analysis.

It is needless to emphasize that caution should be taken not to select applications with software errors; however, with the increased sophistication and complexity of software design, it becomes more difficult to test all possible software errors. Based on the findings of this study, software errors caused confusions and frustrations. The unsolvable errors also affected the subject's ability to solve problems. Therefore, in selecting applications for

instruction, special attention should be directed to ensure that the applications used are thoroughly tested.

Error detection

The third area in which results indicated implications for educational practice relates to helping students detect errors in the answers obtained from computer executions. The accuracy of information is the foundation of sound decisions. With large amounts of data, it is difficult (if is not impossible) to manually perform the operation to confirm the answers obtained from the computer. The findings of this study showed that undetected errors in results led to unreasonable decisions. Therefore, it is essential to help students develop strategies in checking the correctness of execution results. As students are assisted in developing strategies in detecting errors, they may also simultaneously improve their awareness of the accuracy of computer answers.

> It is recommended that instructional approaches be developed which teach students to detect errors and make judgments on the usefulness of information gathered.

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Appendix A: Background Information on Subjects

Sbjct	Gndr	Age	GPA	Sts	Education				Experience	
					Dg	Mjr	Bus	Cmptr	Bus	Cmptr
III.1	F	32	4	G	BA	BUS ED	BLAW, MTG, FNC, MGT, ACT, OFF MGT, RDS MGT, BUS COMM.	Intro, 123, HG, DP, dBASE	Secretary	Appleworks, PM, HG, WPft, VT, 123, WORD, dBASE
III.2	F	32	4	G	BA	ACT	108 Credits, Licentiate in ACT	FORTRAN, BASIC, 123, ACCPAC, CRCA, dBASE	Auditor-4 yrs Lecturer in auditing	Review ACT sys., Implementation of ACCPAC
III.3	F	29	3.5	G	MED	CISY	ECON, ACT, BUS COMM.	123, dBASE, WPft		Assisting use of WPft
III.4	F	25	3.9	G	BA	ECON	ECON, ACT, CAD, Int'l FNC	dBASE, 123	Off. Mgr, Sales rep	123
III.5	F	37	4	S	AS	BUS MGT	ACT, MTG, MGT, BLAW, Ins., Human rel., Int'l Bus	SS, DB, WP, dBASE	Secretary, Comm. Coordinator, Advertising, Personnel Mgr, Purchasing	WP, EMail, DB
III.6	F	47	2.9		MA	SP ED	ACT, MGT, MTG	123, dBASE, WPft	None	None
IV.1	M	30	2.9	S			ACT	5 cmptr languages, dBASE	Adm. clerk, Library assistant	Created database sys., Used numerous WP & SS
IV.2	F	46	4	G	BA	BUS ED	ECON, FNC, BLAW, Stats.	123, DP, dBASE, WPft	Teacher--10 yrs, Mkg rep for IBM --4 yrs, Secretary	WP, DP, others
IV.3	M	23	3	S		BUS ED	ECON, MGT, MTG, Info Sys., Stats.	Intro, 123, HG, dBASE	Data processor	WPft, 123, dBASE
IV.4	M	30	3.6	G	MA	BUS ADM	ACT, MGT, ECON	WPft, dBASE, 123	Staff in shipping co.	WPft
IV.5	F	34	3.4	J			BLAW, T&D, MTG, ORD, Int'l Bus,	Intro, dBASE	Legal secretary --2 1/2 yrs Personnel Coordinator --5 yrs	123, Q&A, WPft, Paradox, dBASE, HG
IV.6	F	21	3.1	S	AA		ACT, MGT, MTG, BUS, Writing, Human Res.	Intro, WPft, 123, dBASE	Secretary, Interns in T&D	WPft, 123, Windows

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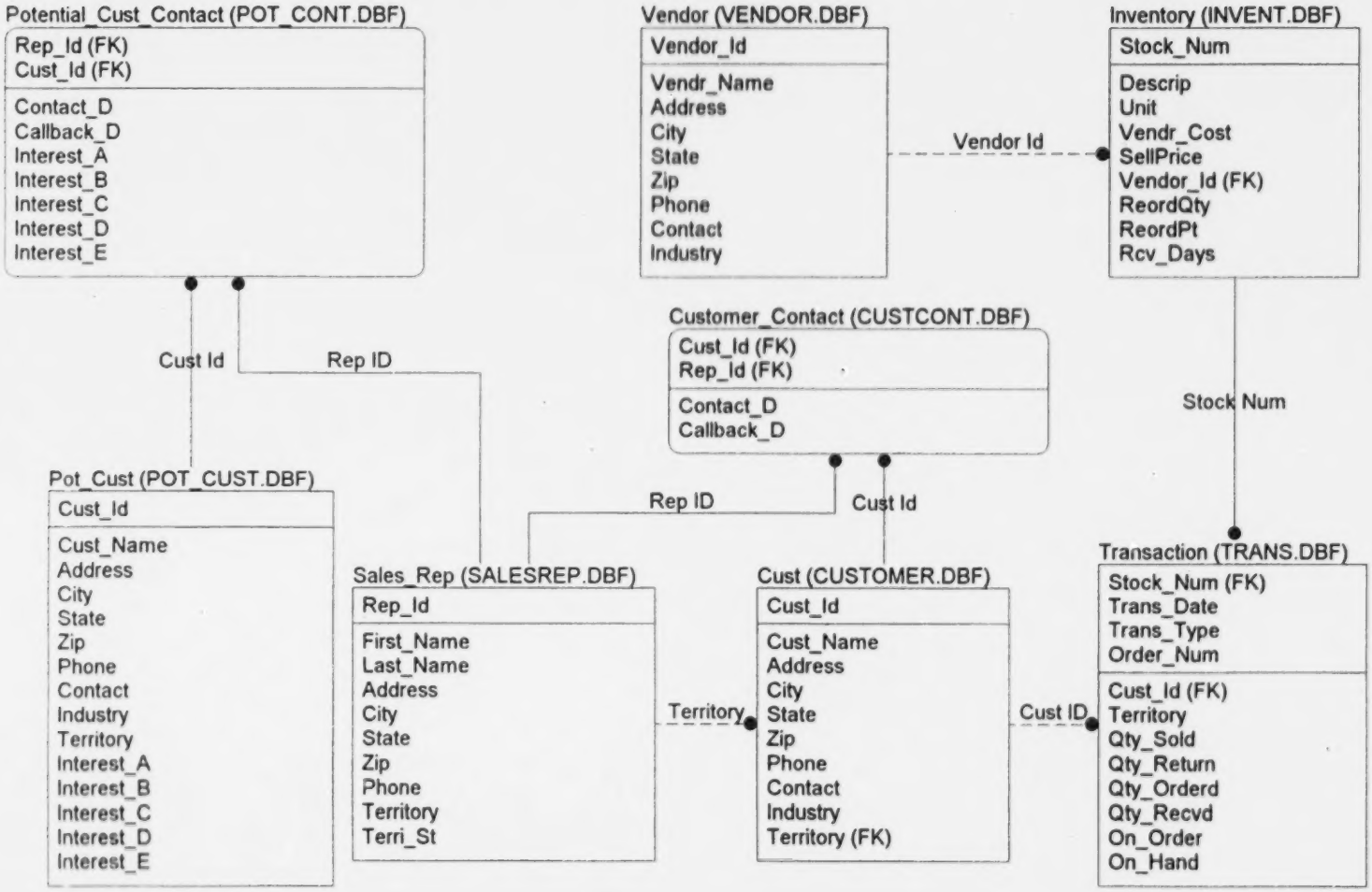
Appendix B: Database Model of Bits & Bytes Inc.



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Appendix C: Examle of problem solving processes (Subject 6 in the menu selection group

The Importance of Workplace Basics Competencies (SCANS) as Perceived by Beginning Business Teachers and Experienced Business Teachers

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Today, many school, business, community, and government leaders recognize the importance of education for the workplace. This study was conducted to determine the importance of workplace basics competencies (SCANS) for business workers as perceived by beginning and experienced business teachers. Areas of both agreement and disagreement exist among and between beginning and experienced business teachers' perceptions of the importance of workplace basics competencies. Significant differences were found in the responses of the two teacher groups regarding the perceived importance of workplace basics competencies. Beginning business teachers rated the competencies more important than experienced business teachers.

The explosive growth of technology and international business is impacting all types and sizes of businesses in this information decade. Today's workplace is changing. Eurich (1985), National Academy of Sciences et al. (1984), and U.S. Department of Labor (1993) reported that employers are often dissatisfied with the quality of high school graduates. Parnell (1991) concluded that a large number of high school graduates lack the basic skills that are important for success in today's workplace. The U.S. Department of Labor (1992b) emphasized that teachers must educate young people more effectively in schools and produce qualified workers who have both the technical skills and basic skills to work productively in today's workplace.

Business leaders have indicated that they need employees who have a higher level of employability skills, such as good communication, reasoning, problem-solving, decision-making, teamwork, and leadership, if they are to find and hold good jobs in today's workplace (Agency for Instructional Technology, 1992; Carnevale et al., 1991; Dole, 1989; McLaughlin et al., 1988; U.S. Department of Labor et al., 1988). Assisting youth in the transition from school to work must be enhanced through business and education partnerships that provide authentic work-based learning experiences for students and teachers. Business educators must teach students both employability skills as well as high levels of technical skills if they are to be successful transitioning to and competing in the workplace.

The Secretary's Commission on Achieving Necessary Skills (SCANS) Report (U.S. Department of Labor, 1991) addressed "workplace know-how" and has captured the attention

of educators, parents, politicians, and business leaders. The Commission examined the changes that have occurred in the world of work and the demands of the current workplace. The SCANS report presented the results of a national survey concerning the importance of workplace basics competencies as perceived by employers and employees in 50 different occupations in business and industry. The Commission reported that students must master workplace basics competencies, in addition to job specific skills, if they are to find and keep good jobs in today's job market. The SCANS report indicated that the five competency domains of "workplace know-how" (Resources, Information, Interpersonal Skills, Systems, and Technology) encompassed 20 workplace basics competencies (SCANS) needed by employees. The Commission concluded that the competencies are applicable from the shop floor to the executive suite and should be taught in an integrated fashion, reflecting the workplace context in which they are applied. In addition, the Commission recommended that educators need to begin early to help students see the relationships between what they study and contextual applications in the real world.

Today, school, business, community, and government leaders are recognizing the importance of education for the workplace and the need for collaboration when preparing students to enter, make progress, and achieve success in the workplace. Do secondary business teachers perceive that workplace basics competencies (SCANS) are important? What is the perceived importance of workplace basics competencies (SCANS) by beginning business teachers and experienced business teachers in secondary schools?

Purpose

The purpose of the study was to determine the importance of workplace basics competencies (SCANS) for business workers as perceived by beginning and experienced business teachers in secondary schools. This information should help business teacher educators prepare beginning teachers and inservice experienced teachers to better equip students for the workplace, assisting students transition from school to work and closing the gap between the classroom and the workplace.

This descriptive study was designed to answer the following research questions:

1. What is the perceived importance of workplace basics competencies (SCANS) by beginning business teachers and experienced business teachers in secondary schools?

2. Are there any significant differences in the perceived importance of workplace basics competencies (SCANS) between beginning and experienced business teachers in secondary schools?

Methodology

Data for the study were collected by a survey questionnaire. The questionnaire was adapted from the SCANS Report competencies and included the 20 competencies the Commission had identified. The Workplace Basics Competencies (SCANS) Questionnaire was divided into three sections containing 26 items: 20 items concerning the workplace basics competencies (SCANS), one comment question pertaining to respondents' perceptions of the three most

important competencies, and five items for collecting demographic information. A seven-point Likert-type scale for responding to each of the 20 workplace basics competencies (SCANS), ranging from "very important" (7) to "not important" (1), was used.

The population consisted of business teachers in Missouri public secondary schools. A list of business teachers was obtained from the State Department of Elementary and Secondary Education. The 105 business teachers who were completing their first year of teaching and a randomly selected sample of 105 experienced business teachers (teachers who had completed 16 or more years of teaching) were sent questionnaires. Responses were received from 87 (83%) of the beginning business teachers and 80 (76%) of the experienced business teachers.

To allow statistical analysis of the data, the "not important" ratings through "neutral" ratings (from 1 to 4) were combined. A chi-square test of independence was used to determine if significant differences existed between the responses of beginning and experienced business teachers. The .05 level of significance was used. Means, percents, and rankings were used to describe the data obtained in the study. Also, demographic data were used to help further analyze the findings.

Findings

Of the 167 respondents, nearly two-thirds (63.5%) of the business teachers reported that they taught in rural areas. A high percentage (83.8%) of the business teachers who responded to the questionnaire were female. Over one-half (55.7%) of the business teachers taught both business skills and basic business subjects courses. There were no major differences between the beginning and experienced business teachers regarding the above three areas. However, nearly three-fourths (73.8%) of the experienced business teachers as compared to less than one-half (47.1%) of the beginning business teachers made contact with business/industrial employers and/or employees semi-annually or more frequently.

A summary of the responses of beginning business teachers and experienced business teachers relative to their importance ratings of the workplace basics competencies (SCANS) is presented in Table 1. The importance ratings of the workplace basics competencies (SCANS) for both groups of business teachers were high. The average rating of importance for the 20 competencies, using a 7.0 scale, was 5.83 for the beginning business teachers and 5.54 for the experienced business teachers. Fourteen of the competencies (C2, C3, C4, C5, C7, C9, C10, C12, C13, C16, C17, C18, C19, and C20) were rated more important by the beginning business teachers; the remaining six competencies (C1, C6, C8, C11, C14, and C15) were rated more important by the experienced business teachers.

The Information Domain was rated most important by both groups of business teachers. The beginning business teachers' mean rating for the Information Domain was 6.20; the experienced business teachers' mean rating of the domain was 6.01. The domain rated least important by both groups was the Systems Domain. The Systems Domain had a 5.34 mean rating of importance by the beginning business teachers and a mean rating of 4.97 by the experienced business teachers. Both beginning and experienced business teachers rated the five domains of workplace basics competencies (SCANS) in the following rank order of importance: Information, Interpersonal Skills, Resources, Technology, and Systems.

Both groups of business teachers (beginning and experienced) ranked the 20 competencies somewhat similarly (Table 2). Competency 9 (Interpersonal Skills Domain)--"Participates as a Member of a Team" was rated most important by the beginning business teachers while Competency 1 (Resources Domain)--"Allocates Time" was rated most important by the experienced business teachers. Competency 20 (Technology Domain)--"Maintains and Troubleshoots Technology" was rated least important by the beginning business teachers. In contrast, Competency 2 (Resources Domain)--"Allocates Money" was rated least important by the experienced business teachers.

Further analysis of the two groups of business teachers' perceptions of the importance of the workplace basics competencies (SCANS) revealed that both groups tend to perceive the same competencies as being most important and least important. A comparison of the nine top ranked competencies by both groups revealed that eight of the same competencies (C1, C5, C6, C7, C8, C9, C11, and C14) appeared on each group's list. Also, three of the four competencies that were ranked least important by both groups were the same (C2, C17, and C20). Competency 4 (Resources Domain)--"Allocates Human Resources" had the greatest difference in ranking; it was ranked 7 by the beginning business teachers and 16 by the experienced business teachers.

A summary of the responses of the beginning and the experienced business teachers indicating the extent to which workplace basics competencies (SCANS) are perceived as important by each group is presented in Table 3. The workplace basics competencies (SCANS) on which there was a pronounced disagreement between the two groups are easily detected. The greatest differences occurred in the perceived importance of C4 (Resources Domain), C5 (Information Domain), C9 (Interpersonal Skills Domain), C16 (Systems Domain), and C19 (Technology Domain). The differences in the ratings of the beginning and the experienced business teachers on the importance of these five competencies (C4, C5, C9, C16, and C19) were significant at the .01 level. The mean ratings of the perceived importance of each of these competencies were higher for the beginning business teachers (Table 1).

Significant differences at the .05 level were found in the responses of the two teacher groups regarding the importance of an additional nine competencies: C1 and C2 (Resources Domain); C7 and C8 (Information Domain); C10, C11, and C13 (Interpersonal Skills Domain); C17 (Systems Domain); and C18 (Technology Domain). Beginning business teachers rated six of these competencies (C2, C7, C10, C13, C17, and C20) higher while experienced teachers rated the other three (C1, C8, and C11) higher (Table 1).

Table 1

Importance Ratings of Workplace Basics Competencies (SCANS) by Beginning and Experienced Business Teachers

Workplace Basics Competency	Beginning Teachers' Mean Rating	Experienced Teachers' Mean Rating
Domain 1--Resources		
C1 Allocates Time	6.24	6.45
C2 Allocates Money	5.39	4.49
C3 Allocates Material and Facility Resources	5.49	5.19
C4 Allocates Human Resources	6.16	5.18
Domain 2--Information		
C5 Acquires and Evaluates Information	6.25	5.71
C6 Organizes and Maintains Information	6.20	6.23
C7 Interprets and Communicates Information	6.28	5.80
C8 Uses Computers to Process Information	6.07	6.31
Domain 3--Interpersonal Skills		
C9 Participates as a Member of a Team	6.47	6.41
C10 Teaches Others	5.78	5.49
C11 Serves Clients/Customers	6.21	6.30
C12 Exercises Leadership	5.98	5.23
C13 Negotiates to Arrive at a Decision	5.84	5.38
C14 Works with Cultural Diversity	6.05	6.16
Domain 4--Systems		
C15 Understands Systems	5.25	5.35
C16 Monitors and Corrects Performance	5.67	4.95
C17 Improves and Designs Systems	5.11	4.60
Domain 5--Technology		
C18 Selects Technology	5.62	5.36
C19 Applies Technology to Task	5.63	5.50
C20 Maintains and Troubleshoots Technology	4.99	4.80

Table 2

Rankings of Workplace Basics Competencies (SCANS)--Beginning Business Teachers vs. Experienced Business Teachers

Beginning Teachers			Experienced Teachers		
Competency	Mean	Rank	Competency	Mean	Rank
C9	6.47	1	C1	6.45	1
C7	6.28	2	C9	6.41	2
C5	6.25	3	C8	6.31	3
C1	6.24	4	C11	6.30	4
C11	6.21	5	C6	6.23	5
C6	6.20	6	C14	6.16	6
C4	6.16	7	C7	5.80	7
C8	6.07	8	C5	5.71	8
C14	6.05	9	C19	5.50	9
C12	5.98	10	C10	5.49	10
C13	5.84	11	C13	5.38	11
C10	5.78	12	C18	5.36	12
C16	5.67	13	C15	5.35	13
C19	5.63	14	C12	5.23	14
C18	5.62	15	C3	5.19	15
C3	5.49	16	C4	5.18	16
C2	5.39	17	C16	4.95	17
C15	5.25	18	C20	4.80	18
C17	5.11	19	C17	4.60	19
C20	4.99	20	C2	4.49	20

Table 3

Percent of Beginning and Experienced Business Teachers Indicating Different Degrees of Importance of Workplace Basics Competencies (SCANS)

SCANS Comp.	Beginning Teachers' Responses# (N=87) 4	5	6	7	Experienced Teachers' Responses# (N=80) 4	5	6	7	Chi Square
C1	3.4	6.9	51.7	37.9	3.8	6.3	30.0	60.0	9.20*
C2	31.0	20.7	19.5	28.7	46.3	20.0	22.5	11.3	8.96*
C3	13.8	31.0	41.4	14.9	25.0	32.5	26.3	16.3	5.23
C4	10.3	20.7	57.5	11.5	27.5	22.5	25.0	25.0	21.39**
C5	1.1	14.9	41.4	42.5	16.3	16.3	35.0	32.5	12.94**
C6	3.4	23.0	24.1	49.4	5.0	10.0	38.8	46.3	7.38
C7	2.3	19.5	26.4	51.7	12.5	18.8	35.0	33.8	10.17*
C8	3.4	24.1	34.5	37.9	6.3	7.5	30.0	56.3	11.07*
C9	1.1	2.3	44.8	51.7	3.8	12.5	18.8	65.0	17.24**
C10	2.3	33.3	48.3	16.1	12.5	33.8	33.8	20.0	8.52*
C11	5.7	6.9	48.3	39.1	8.8	3.8	28.8	58.8	8.70*
C12	16.1	34.5	31.0	18.4	17.5	46.3	21.3	15.0	3.29
C13	6.9	24.1	47.1	21.8	17.5	33.8	36.3	12.5	8.52*
C14	9.2	13.8	37.9	39.1	6.3	12.5	33.8	47.5	1.41
C15	20.7	41.4	29.9	8.0	18.8	27.5	42.5	11.3	4.68
C16	3.4	37.9	47.1	11.5	33.8	23.8	31.3	11.3	26.65**
C17	27.6	34.5	36.8	1.1	42.5	31.3	20.0	6.3	9.90*
C18	6.9	41.4	34.5	17.2	20.0	26.3	36.3	17.5	8.27*
C19	2.3	50.6	28.7	18.4	17.5	26.3	32.5	23.8	17.15**
C20	34.5	27.6	32.2	5.7	36.3	35.0	22.5	6.3	2.21

#Column No. 4 indicates percent of respondents who indicated the combined ratings from 1 to 4 ("not important" to "neutral"); No. 5 and No. 6 indicates those who responded between "neutral" and "very important"; and No. 7 indicates those who responded "very important."

*P < .05.

**P < .01.

Conclusions

Areas of both agreement and disagreement exist among and between the perceptions of beginning and experienced business teachers regarding the importance of workplace basics competencies (SCANS). The data revealed that both beginning and experienced business teachers in secondary schools have high perceptions regarding the importance of workplace basics competencies (SCANS). The results of this study are consistent with the SCANS Report (U.S. Department of Labor, 1991) concerning the importance of workplace basics competencies (SCANS) for business and industry employees as perceived by employers and employees.

Both beginning and experienced business teachers tend to identify the same competencies as being most important. These include competencies from the Interpersonal Skills, Information, and Resources Domains. Likewise, both groups of business teachers tend to identify the same competencies as being of least importance--competencies from the Technology, Systems, and Resources Domains.Beginning business teachers tend to rate the competencies higher in importance than experienced business teachers. Fourteen of the 20 competencies were rated more important by the beginning business teachers. Beginning business teachers perceive competencies concerned with the Technology Domain as being more important than do experienced business teachers.

Beginning business teachers and experienced business teachers tend to differ greatly in their perceptions of the importance of workplace basics competencies (14 of the 20 were significantly different). The competencies that were rated differently by the beginning and experienced business teachers were distributed across all five domains: Resources (3), Information (3), Interpersonal Skills (4), Systems (2), and Technology (2).

Recommendations

Since the importance attached to workplace basics competencies (SCANS) by beginning and experienced business teachers in secondary schools can be identified, special or added attention should be given by teacher educators to develop appropriate instructional/learning strategies that insure these competencies are developed by all students. Teacher education programs need to address the teaching of workplace basics competencies (SCANS) for both prospective teachers and those already involved in the profession. Because most states require a minimum number of days of seat-time-based school instruction and programs tend to reflect these minimums, teachers need to devise ways to incorporate the development of workplace basics competencies (SCANS) into the continually evolving, already crowded business curriculum. Successful strategies need to be shared with other teachers and administrators.

To assist teachers in teaching the SCANS competencies to their students, the SCANS Commission developed Teaching the Scans Competencies (U.S. Department of Labor, 1993). This publication provides practical suggestions for designing and implementing instructional experiences as well as descriptions of actual programs that focus on developing workplace basics competencies (SCANS). In addition, SCANS Blueprint for Action: Building Community Coalitions (U.S. Department of Labor, 1992a), provides suggestions for becoming involved, summarizes resources that can be used in developing workplace basic skills and concepts, and presents typical real-world examples of the competencies.

Workplace basics can and should be integrated into each business subject matter area, both the vocational-technical curricula as well as the basic business curriculum areas. Teachers need to help students connect knowledge and skills learned in classrooms to the workplace so they understand typical applications and real-world uses of the course content they are studying. These connections need to be made intellectually explicit, and the emphasis should be on teaching skills and knowledge in context. Teaching in context implies that students are provided opportunities to apply these workplace basics in real-life situations or simulations, e.g., problems or projects related to workplace situations as well as internships, mentorships, and "shadowing" workers on the job.

Along with the emphasis on learning in context, teachers need to implement instructional/learning strategies that focus on students becoming more responsible for and active in their own learning. Linkages between education and business need to be strengthened to help develop appropriate curricula which include workplace basics competencies (SCANS) and meet the needs of both business and students.

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WORD PROCESSING COMPETENCIES

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Research indicates that people tend to use only about 5 percent of the capabilities available in word processing software. Does this indicate that we are over-buying, under-using, or not exploring our software carefully enough after purchasing it? Perhaps the solution involves additional training or retraining to inform users of the features which are available on their word processing program (Yakal, 1991).

The major objective of this study was to determine to what extent word processing was used by businesses, what competencies were required by those businesses, and how those competencies were being learned in Mid-South states. Word processing competencies were identified by Otto (1991), but had not been verified by businesses using word processing. Competencies needed by business should be included in the business curriculum and courses.

Review of Literature and Problem Statement

Success in the business world of today requires the ability to function efficiently in a technical environment. According to a 1990-91 survey, 12 percent of strictly typing applications are done on an electronic typewriter, 7 percent are done on a dedicated word processor, and the remaining 81 percent are done on a word processing application running on a computer (Romei, 1992). Since most people will interact with computers at their place of employment, a knowledge of computers and business application software is becoming extremely important in both job performance and career development (Kroenke, 1984). Competent operation of word processing equipment is imperative in this environment which includes networking, electronic mail, spreadsheets, databases, graphics, CAD, and multimedia technology.

The impact of the computer has not yet peaked. Every year computers are becoming less expensive and yet more powerful. Thus, the use of computers is increasing as is the demand for knowledgeable people to operate them (Holley, 1982). Research indicates that expanded computer use, rapid office technology changes, the changing nature of office jobs, new systems and procedures, and new careers related to information processing have resulted in a need for additional basic skills and knowledge for employment in the automated office (Otto, 1991).

Like computers, software packages are developing at an amazing rate (Miles, 1992). Software users are demanding programs that allow the use of a variety of programs that operate together seamlessly. Thus, software houses are designing products around how people actually use them rather than how software engineers think they should use them. Gone are the "roadblocks" that caused inexperienced word processing users difficulty (Miles, 1992).

Word Processing. The word processing software of today is opening new awareness for more people to communicate. Word processing has changed from a single function, stand-alone application to an integral part of a department's information processing needs. Word processing became part of the "bigger plan" when it changed from a secretarial to a professional tool (Barr, 1989). People initially moved from the dedicated systems to personal computers that used word processing software as one application. Those same individuals are now shifting from character-based word processing software to packages incorporating graphical user interfaces (GUIs). The introduction of Windows 3.0 (a GUI) inspired a new breed of word processors having the ability to use the word processor to import and manipulate graphics along with the classical text handling functions available to the operator. However, this equipment came with a price--more powerful, more expensive computer systems (Yakal, 1991).

In the PC environment of today, people can produce things like newsletters with graphics and other multicolumn documents. Even internal reports, which are not usually eye appealing, are becoming so attractive that the data jumps out at you (Yakal, 1991). Word processing software is now opening new avenues for more people to communicate (Yakal, 1991).

Word processing has affected all levels of productivity. On an individual basis, it has allowed for efficiency gains of individual workers. Work flow has changed as more professionals use the tool to initially develop a document and often send it to a secretary for final editing, formatting, and printing. Work group productivity has also been affected. Word processing was often the first form of groupware available on local area networks, thus allowing all users in a department or group to share documents whose management became a key concern as they were altered and stored in different forms (Barr, 1989).

Concern over document management escalated into the development of information management as word processing grew from the work group to the enterprise-wide environment. Document interchange and common formatting were required, and word processing software became standardized to reduce these problems (Barr, 1989).

A 1987 study revealed that word processing software was used by 75 percent of the internal auditors responding to the survey, while approximately 38 percent used spreadsheet applications. Word processing is used primarily for report generation (Kaplan, 1991). Ease of revision or editing of text has contributed to the expanded use of word processing (Baker and Pearch, 1987).

Whitmyer (1991) predicts that the major players in software development--Microsoft, Lotus, WordPerfect, and Borland--would expand their product lines to cover all major applications: spreadsheets, databases, word processing, and communications. In business, local area networks (LANs) will give all users access to the same software and data (Whitmyer, 1991). Continued growth is expected in the document and image processing fields, together with project management, databases, spreadsheets, and word processing (Miles, 1992). The addition of graphics and the increased layout versatility has expanded the use of desktop publishing software (Wormald, 1989).

The Windows word processing package has spawned a new division of word processing software, providing an opportunity for word processing specialists to increase their worth by mastering the new technology (Wormald, 1989). Yakal (1991) reported that the computer world was moving toward the Windows environment and some retraining would be needed. The built-in document conversion feature of the new Windows made "the switch" even simpler.

Competencies. Research indicates that people tend to use only about 5 percent of the capabilities available in word processing software. Does this indicate that we are over-buying, under-using, or not exploring our software carefully enough after purchasing it? Perhaps the solution involves additional training or retraining to inform users of the features which are available on their word processing program (Yakal, 1991).

Otto's (1991) survey rated the importance of 285 competencies to identify those necessary for an applications course. Results indicated eight competencies which were **essential** for inclusion in an applications course and seven competencies which were important for inclusion in a word processing course. The essential competencies included: keyboarding, entering text, editing, inserting and deleting characters, format, file management, printing, and miscellaneous (help menu). The **important** competencies include: keyboarding, editing, confirm, format, file management, printing, and miscellaneous (Otto, 1991). Table 1 and Table 2 in Appendix A provide detailed listings of the study's competencies.

Objectives

The major objective of this study was to determine to what extent word processing is used by businesses, what competencies were required by those businesses, and how these competencies were being learned in Mid-South states. Word processing competencies had been identified by Otto (1991), but had not been verified by businesses using word processing. Competencies needed by business should be included in the business curriculum and courses.

Methodology

The procedures for this research project included: 1) development of a questionnaire; 2) validation of the questionnaire; 3) appropriate revisions of questionnaire; 4) mailing of questionnaire to selected human resource managers in the Metropolitan Statistical Areas of Little Rock, Arkansas; Jackson, Mississippi; New Orleans, Louisiana; Houston, Texas; and Oklahoma City, Oklahoma; 5) one follow-up letter to the questionnaires; 6) processed received data using statistical analysis; 7) analyzed, interpreted, and compared processed data.

Findings

Of the 81 usable questionnaires returned (661 mailed), all 81 of the respondents were currently using word processing software packages. The number of employees using word processing ranged from 1 to 4,500 with an average of 212.

As shown in Table 1, 62 businesses (76.5 percent) commonly used WordPerfect. Microsoft Word and Q & A were the second and third most commonly used word processing software but by less than 30 percent.

TABLE 1
Word Processing Software Used

Software	No.	Percent
WordPerfect	62	76.5
Microsoft Word	28	34.6
Q & A	15	17.9
Professional Write	9	10.7
Word Star	8	9.5
Ami Pro	6	7.1
Macintosh ASCII	4	4.8
Display Write	3	3.7
Word for Windows	2	2.4
Multi Mate	2	2.4

Word processing software was used company-wide by 34 (42.0 percent) of the respondents using word processing software. Twenty-seven (33.3 percent) of the businesses responding were using word processing software in their personnel and human resource management departments. Other identified departments using word processing software were: Administrative 27 (33.3 percent), Accounting 26 (32.1 percent), and Marketing and Sales 15 (18.5 percent).

The businesses had been using word processing software an average of eight years nine months with some businesses having used them as long as they have been available.

In response to questions regarding the uses of word processors by the businesses, the primary applications were letters (96.3 percent), memos (92.6 percent), and reports (91.4 percent). Other

high uses included envelopes and labels, tables, newsletters, columnar text, and e-mail. Table 2 identifies the applications and the responses by businesses.

TABLE 2
Word Processing Applications

Application	No.	Percent
Letter	78	96.3
Memos	75	92.6
Reports	74	91.4
Envelopes and Labels	66	81.5
Tables	61	75.3
Newsletters	54	66.7
Columnar Text	52	64.2
Electronic Mail	37	45.7

From the business responses to the use of built-in functions in word processors, spellcheck and centering functions were used the most by 77 (95.1 percent) each. The underline and bold functions were next with 76 (90.5 percent) each. The built-in function for tables of authorities/generations were used the least by only 14 (17.3 percent). Table 3 compares the uses of built-in functions by the businesses.

In responding to what employees who use word processing needed to know, 76 businesses (93.8 percent) indicated that basic formatting was the most needed skill. The least needed skill was macros by 22 (27.2 percent). Macros and graphics were the only skills that were below 70 percent. Table 4 shows the skills employees need to have according to the businesses responding.

The editing competencies had been identified by Otto as correcting by backspacing, deleting to the left, deleting to the right, keying over existing text, searching for words, searching and replacing text, and undeleting text. Correcting by backspacing was considered essential by 59.3 percent with only 2.5 percent considering it not important. Keying over existing text was considered essential by 40.7 percent with not important indicated by only 2.5 percent. Deleting to the right was considered important or better by 95.1 percent while deleting to the left was 92.6 percent. Only 27.2 percent considered undeleting text as essential but had a total of important or better of 90.1 percent. Searching and replacing text was considered important or better by 86.4 percent, and searching for words by 85.2 percent.

TABLE 3 Built-In Functions		
Functions	No.	Percent
Spellcheck	77	95.1
Center	77	95.1
Underline	76	93.8
Bold	76	93.8
Tabs	75	92.6
Page Number	70	86.4
Move and Copy	70	86.4
Font Changes	68	84.0
Headers and Footers	64	79.0
Merge Documents	62	76.5
Date code	55	67.9
Line Draw	52	66.7
Search and Replace	52	66.7
Thesaurus	50	61.7
Tables	49	60.5
Select	48	59.3
Outline	46	56.8
Graphics	46	56.8
Macros	39	48.1
Styles	37	45.7
Index/List Generators	31	38.3
Table of Contents/Generations	29	35.8
Table of authorities/Generations	14	17.3

TABLE 4
Word Processing Knowledge Areas

Need to Know	No.	Percent
Basic Formatting	76	93.8
Speller/Thesaurus	69	85.2
Move/Copy	64	79.0
File	61	75.3
Disk Maintenance	59	72.8
Graphics	28	34.6
Macros	22	27.2

More than 50 percent of the respondents considered using return or enter, keying capital letters, and using the wrap around feature as essential. Using return or enter received no not important responses. Keying capitals and using wrap around received only 1 not important response each.

For the file management competencies, storing a document to disk and retrieving a document file from storage were rated essential by more than 50 percent of the respondents. Those file management competencies rated as important or better by more than 90 percent of the respondents were storing a document to disk, storing a document to disk and quitting, retrieving a document file from storage, storing a document to disk and resuming, copying a document file, deleting a document file from storage, loading or saving part of a document file, and renaming document files. Table 5 lists the file management competencies rated as important or better.

Otto had identified 23 formatting competencies. Only adjusting margins and setting left and right margins were considered essential by 50 percent or more of the respondents. All 23 competencies were considered as important or better by 50 percent or more of the respondents. The formatting competencies rated as important or better by the respondents are shown in Table 6.

Of the inserting and deleting competencies, only inserting and deleting a sentence and moving a block were rated as essential by 50 percent or more of the respondents. All 10 of the identified inserting and deleting competencies were rated as important or better by more than 90 percent of the respondents. Table 7 identifies those business responses rated as important or better on the inserting and deleting competencies.

TABLE 5
File Management Competencies

File Management	No.	Percent
Store to Disk	79	97.5
Store to Disk and Quit	78	96.3
Retrieving File from Storage	77	95.1
Store to Disk and Resume	77	95.1
Copying a File	77	95.1
Delete File from Storage	76	93.8
Load or Save Part of File	74	91.4
Display Files on Disk	74	91.4
Rename Files	74	91.4
Store to Disk and Switch to Another File	73	90.1
Consolidate Two Files	71	87.7
Store to Disk with Overwrite	69	85.2
Abandon a File	68	84.0
Lock or Protect File	67	82.7
Change Data Drive	66	81.5

Of the 12 keying competencies, three were identified as essential by 50 percent or more of the responding businesses. Those competencies were creating a document, cursor movement keys, and function keys. All of the competencies were rated as important or better by more than 75 percent of the respondents. Table 8 lists the keying competencies and the percentage of respondents rating them as important or better.

None of the miscellaneous competencies were rated as essential by 50 percent or more of the business respondents. The spelling function and Help were rated as important or better by more than 90 percent of the businesses. Only boiler plating was not rated as important or better by 50 percent or more of those responding. Table 9 identifies the miscellaneous competencies and the percent of response by the businesses of important or better.

TABLE 6
Format Competencies

Formatting	No.	Percent
Adjust Margins	80	98.8
Insert Blank Lines	80	98.8
Set Left and Right Margins	79	97.5
Insert Page Break	79	97.5
Indent Paragraph	79	97.5
Set Top and Bottom Margins	79	97.5
Center Headings	79	97.5
Indent Left and Right	78	96.3
Justify Margins	78	96.3
Double Space	78	96.3
Set Tabs	77	95.1
Adjust Line Spacing	77	95.1
Center Page	75	92.6
Adjust Word Wrap	74	91.4
Margin Release	74	91.4
Tab Align	73	90.1
Work with Indent Tabs	73	90.1
Set Decimal Tabs	72	88.9
Set Characters per Inch	70	86.4
Set Lines per Inch	70	86.4
Work with Decimal Tabs	66	81.5
Work with Line Draw	65	80.2
Super/Subscript	64	79.0

TABLE 8
Key Competencies

Key	No.	Percent
Create Document	78	96.3
Cursor Movement Keys	78	96.3
Underline Text	77	95.1
Boldface	77	95.1
Center Headings	76	93.8
Function Keys	75	92.6
Center Lines	75	92.6
Create Forms	73	90.1
Lines: Status, ruler, and menu	72	88.9
Hard Spaces & Returns	70	86.4
Go To Command	65	80.2
Numbered Lists	63	77.8

In promotion and granting merit raises, only 18 (22.2 percent) indicated that word processing knowledge would be highly desirable while 39 (48.1 percent) indicated it would be desirable. Seventeen (21.0 percent) indicated it was not needed, and 2 (2.5 percent) of the businesses felt it would negatively affect an employee's prospects.

When asked if word processing usage would increase in their businesses, 67 (82.7 percent) indicated it would. Training was the primary difficulty in word processing usage by 17 (21.0 percent) of the businesses. Other difficulties identified included: hardware insufficiency and incompatibility, lag time between installation and availability of training, and losing data.

On the job (79.0 percent) was where most employees received training on word processing software. The other principal means of learning word processing software reported were technical/community colleges by 14 (17.3 percent), vocational schools by 11 (13.6 percent), and four-year colleges or universities, with high schools, and adult learning centers by 8 each (9.9 percent).

TABLE 7
Insert and Delete Competencies

Insert and Delete	No.	Percent
Sentence	79	97.5
Move Block of Text	79	97.5
Copying Text	78	96.3
Copying Blocks	78	96.3
Reformat Text	78	96.3
Move Text	77	95.1
Delete Block of Text	76	93.8
Delete to End of Line	75	92.6
Insert and Delete Words	75	92.6
Delete to End of Page	75	92.6

Printing a document was rated as essential by 69.0 percent of the respondents, while knowing the printer setup was essential for 50.0 percent. No other printing competencies were rated as essential by 50 percent or more of the respondents. Of these competencies, printing a document, printing multiple copies, printing the current page, and printing part of a document were rated as important or better by more than 90 percent of the businesses. No printing competency was rated important or better by less than 50 percent of those responding. Table 10 shows the printing competencies and businesses ratings of important or better.

Forty-one (50.6 percent) of the businesses using word processing indicated that word processing knowledge was highly desirable in prospective employees, and 31 businesses (38.3 percent) indicated it was desirable. Five (6.2 percent) of the businesses indicated it was not needed, but none of the respondents indicated it would negatively affect a prospective employee's opportunity for employment.

Ease of learning and ease of using were the primary factors considered when selecting word processing software with 69.0 percent and 64.3 percent respectively. Ease of interfacing, price, and speed of retrieval were the other factors considered by 50 percent or more of the respondents in selecting a word processing software package. The factors considered in selecting software are listed in Table 11 with the ratings by the responding businesses.

TABLE 9 Miscellaneous Competencies		
Perform Spelling Function	77	95.1
Help Menu	74	91.4
Work with Text or Data Files	72	88.9
Perform Thesaurus Function	68	84.0
Work with Columns and Column Functions	68	84.0
Headers and Footers	66	81.5
Merging Two or More files	66	81.5
Perform Style Functions	66	81.5
Composing Text	65	80.2
Cancel Key	65	80.2
Upper/Lower Case Convert	65	80.2
Perform Grammar Functions	64	79.0
Work with Multiple Files on the Screen	64	79.0
Work with Hyphenation	63	77.8
Endnotes or Footnotes	63	77.8
Sort Function	62	76.5
Insert Text Variables	61	75.3
Work with Windows	60	74.1
Perform Math Functions	57	70.4
Perform Automatic Table of Contents	56	69.1
Defining Macros	54	66.7
Work with Orphans	52	64.2
Perform Automatic Indexing	42	51.9
Boilerplating	36	44.4

TABLE 10
Table Competencies

Print	No.	Percent
Print a Document	77	95.1
Print Multiple Copies	75	92.6
Print Current Page	75	92.6
Print Part of a Document	73	90.1
Print Set-up	72	88.9
Print from Disk	71	87.7
Page Number Position Set-up	71	87.7
Print Screen	70	86.4
Print More than One Document	69	85.2
Print Envelopes	69	85.2
Print Different Sized Paper	68	84.0
Conditional End of Page	68	84.0
Print with Sheet Feeder	67	82.7
Work with Different Fonts and Enhancements	67	82.7
Work with Automatic Pagination	67	82.7
Work with Printer Commands	64	79.0
Print to Disk	63	77.8

Demographics

Businesses indicating use of word processing software were 81 (100.0 percent). A breakdown of the types of businesses responding and of those using word processing is shown in Table 12.

The responding businesses indicated that 52 (61.9 percent) were located in metropolitan areas, and 51 (98.1 percent) used word processing software. Of the 21 (25.0 percent) suburban businesses, 20 (95.2 percent) used word processing software while 7 (87.5 percent) of the 8 (9.5 percent) rural businesses used them.

TABLE 11

Factors Considered in Selecting Software

Factors	No.	Percent
Ease of Learning	58	71.6
Ease of Using	54	66.7
Ease of Interfacing	45	55.6
Speed of Retrieval	43	53.1
Price	43	53.1
Speed of Copying	39	48.1
Speed of Saving	39	48.1
Ease of Technical Support	37	45.7
Speed of Speller and Thesaurus	34	42.0
Speed of Moving	33	40.7
Ease of Documentation	32	39.5
Speed of Sorting	30	37.0
Other	14	17.3

The 81 responding businesses employed 81,281 employees with 14,187 (17.5 percent) of them using word processing software. This is an average of 212 employees using word processing per business. The businesses ranged in size from 14 to 18,000 employees with the average being 1,084. The mode was 1,000 employees with 6, and the midpoint of the range was 335.

Summary

Word processing was used by 100 percent (81) of the responding businesses with WordPerfect being used by 76.5 percent (62) of these businesses. Microsoft Word was used by 34.6 percent (28) responding businesses. Other software packages were used by 18 percent or less of the respondents.

Word processing was used company wide by 42 percent (34) of the responding businesses. Thirty-three percent (27) of the respondents used word processing software in their personnel and human resource departments.

TABLE 12
Type of Responding Businesses

Type of Business	No.	Percent
Manufacturing	29	35.8
Hospital	14	17.8
Utility	8	9.9
Insurance	5	6.2
Retail-Wholesale	5	6.2
Construction	4	4.9
Distribution	2	2.5
Transportation	2	2.5
Finance	2	2.5
Communications	2	2.5
Business Service	2	2.5
Legal Service	1	1.2
Real Estate	1	1.2
Communications	1	1.2
Other	3	3.7

The major difficulty reported in the use of word processing software was lack of training. Most employees have been trained on-the-job and often that was self-training. As word processing usage is expected to increase, the need for training will continue to grow. In selecting the company's current word processing software, ease of learning and ease of use were identified as the primary factors considered by 69 percent and 64.3 percent of the respondents respectively.

Primary applications of word processing by respondents were letters (96.3 percent), memos (92.6 percent), and reports (91.4 percent). Other high uses included envelopes and labels, tables, newsletters, columnar text, and e-mail.

The built-in functions that were used most by responding businesses were the spell check and centering functions which were each used by 95.1 percent of respondents. Other built-in functions used by 50 percent or more of businesses were underline, bold, tabs, page number, move and copy, font changes, headers and footers, merge documents, date code, line draw, search and replace, and thesaurus.

All of the competencies identified by Otto were rated by respondents as **important or better** by 45 percent or more of the responding businesses. Of those competencies, the businesses identified only 15 as **essential** by 50 percent or more of the word processing users. Those dentified as **essential** competencies by respondents include: correcting by backspacing, using return or enter, keyboarding capital letters, using wraparound to enter text, storing document to disk, retrieving document file from storage, storing document to disk and quitting, adjusting margins, setting left and right margins, inserting and deleting sentences, moving a block of text, copying text, creating a document, cursor movement keys, and function keys.

Recommendations

1. The competencies rated as essential must be included in any word processing course, and the competencies rated as important or better should also be incorporated.

2. Word processing training should be made available to businesses, employees, and prospective employees by appropriate schools and individuals.

3. Because of the widespread use of word processing software and the desirability of its skills, word processing should be taught to all business students as a skill, and word processing applications should be used in appropriate subject areas as a tool.

4. Availability to word processing training should be developed to serve traditional and nontraditional students.

5. Word processing trainers/teachers should identify the needs, develop applicable course content, and offer spreadsheet training to all levels of employees.

6. Word processing courses should be developed for and offered to adult learners with particular attention to the needs of businesses.

7. This research should be replicated on a statewide and a national basis.

8. This research should be replicated in three to five years to determine changes in the requirements and needs of businesses, as well as the status of word processing training.

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ELECTRONIC MAIL: ATTITUDES AND EFFECTIVE WRITING

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Objectives

To the average person, computer-mediated communication (CMC) means "e-mail," which is the colloquial and widely accepted term for the computer-based message system category of electronic mail. As it becomes commonplace in business, education, the military, and government, e-mail will become an equal, and perhaps more important communications partner than the telephone. The impact of computer technology on the way business documents are created brings new challenges to educators who prepare students for the business workplace. The problem for business educators is how to develop instruction in the effective use of e-mail.

Strategies for teaching electronic communication to secondary students, undergraduate pre-service teachers, and in-service teachers are not currently very well documented. Relevant variables such as computer attitudes and ratings of effective writing have been investigated individually but need to be studied in relation to one another. Before business educators can begin to develop instruction for e-mail skills, these more fundamental questions must be addressed. Findings of this study provide implications for integrating the use of e-mail technology into the communication curriculum.

The potential usefulness of electronic mail must be considered in light of and balanced by its proclivity for fostering misunderstanding. Thus, traditional instruction for written business communication is quickly becoming outdated and may be even counter-productive for the successful information-based workplace of tomorrow. Even the manner in which student writing has been traditionally evaluated is suspect in this new medium. An approach labeled "holistic" (Quellmalz, 1982), where more emphasis is placed on overall communication effectiveness, is better suited for the evaluation of the more informal writing that is prevalent in this milieu.

This study was designed to investigate and assess communication in an electronic environment within a specific professional work setting. First, the functional use of computer-mediated communication (e-mail) by university faculty was studied. What are the different patterns of

e-mail use in a university setting and for what individual purposes are educators using e-mail? Second, the relationship of e-mail usage, faculty attitudes toward computer technology, and holistic ratings of e-mail messages were examined.

The following research questions were proposed for investigation in the study:

1. How is an individual's attitude toward e-mail technology related to different patterns of e-mail use?

2. How does the holistically rated quality of an individual's e-mail writing samples relate to patterns of e-mail use?

3. How is an individual's attitude toward e-mail technology related to holistic quality ratings of an individual's e-mail writing samples?

Review of Literature

In general, empirical research in written composition has taken two approaches to the question of what constitutes quality, examining errors and syntactical features. Neither approach is entirely satisfactory and neither has provided specific directions for the teaching of effective writing (Witte & Faigley, 1981). In the area of electronic communication, numerous studies have investigated the question of whether writing on computers produces better quality composition than writing by hand. Quality of a written piece is typically measured based on the number of errors found and on syntax or specified subjective criteria.

Pearce and Barker (1991) compared college students' reports written by hand and on the computer. They judged the quality of the reports based on four criteria for "grammatical errors" (capitalization, punctuation, spelling, and vague adverbs); and based on six "writing errors" (readability, passive construction, use of prepositions, trite expressions, wordy expressions, and redundant expressions). The asserted results of the study did not support an inference that basic writing quality will improve when a computer is used. The researchers suggest that the confounding results of previous studies--some of which found computer-assisted writing to improve quality and some of which found antithetical results--may be due to imprecise measuring devices.

Collier (1983) addressed the problematic issue of writing evaluation:

> Teachers, rhetoricians, writers and psychologists might all object that it is impossible to measure either writing skills or creativity. And perhaps rightly so. It is doubtful if consensus could be achieved among the experts about matters so elusive, mysterious and subject to the vagaries of personal taste as what makes for excellent writing skills. (p.9)

The measurement difficulty partially derives from the behavioral science adoration of the methodology of the "hard" sciences such as chemistry and physics. Collier (1983) debunks some of the work of science:

> In these disciplines, despite the warnings of quantum mechanics that the observer and the observed are interlinked, that observations may ineluctably alter that which is being observed, and unexplained irrationalities in the very small and the very large may exist, the scientific method reigns absolute. (p. 10)

In disciplines such as sociology, psychology, and linguistics, plausibility is less than robust when the empirical method of hard science is applied to human activity. Rhetoric has suffered somewhat from this "scientistic" approach where specious quantification replaces a needed humanistic procedure.

In recognition of the difficulty of quantifying measures of writing ability, an approach to evaluation of composition that has gained credence in recent years is one that has been termed "holistic." This method is impressionistic, using a large group of evaluators who are familiar with assessing writing, who practice with particular scales, and who eventually attain a fairly high interrater reliability score.

Quellmalz (1982) has developed a scale for evaluating expository writing which provides separate 6-point rating scales for general impression of the quality of an essay, general competence, coherence, paragraph organization, support for main ideas, and mechanics. This impressionistic scoring allows a rater to make a judgement on the overall quality of a piece of writing:

> The purpose of Impressionistic Rating is to form a single impression of a piece of writing as to how well it communicates a whole message to the reader. Impressionistic scoring assumes that each characteristic that makes up an essay--organization of ideas, content, mechanics and so on--is related to all other characteristics. Impressionistic scoring further assumes that some qualities of an essay cannot easily be separated from each other. In short, the procedure views a piece of writing as a total work, the whole of which is greater than the sum of its parts. (p. 6)

The scale synthesized several strategies of general impression and analytic scoring. Reliability data were collected from controlled research in which several hundred raters had scored over 10,000 essays. After a training session, coefficients of reliability ranged from .89 to .91 on the subscales.

A recent meta-analysis of studies of students' writing using word processors included 28 studies that obtained holistic measures of writing quality (Bangert-Drowns, 1993). An example of this research is a study conducted by Etchison (1985), comparing college level compositions. One group of students produced essays that were handwritten and the other group produced essays that were written using a word processor. Raters using holistic scoring methods were graduate students in the Rhetoric and Linguistics program who were trained for approximately one hour before the rating sessions. Two raters were used for each writing task to be evaluated and a third rater was used to arbitrate where the original raters disagreed on more than one point. The interrater reliability for the holistic scoring of the writing samples ranged from .75 to .84.

Summary of Holistic Evaluation of Writing Studies

How to measure quality in writing is a question that has resulted in endless academic arguments about trying to quantify the unquantifiable. Quality is subjective. The measurement of "correct" syntax or other arbitrary criteria of writing is problematic; even agreement about what constitutes a grammatical "error" is sometimes debatable. Yet a seasoned writer or reader can tell good writing from bad.

Judging writing effectiveness in an non-traditional medium such as e-mail is doubly difficult. Therefore, the impressionistic or holistic approach to writing evaluation discussed in the preceding section is especially appropriate for the present study. The brief, informal, concise nature of the typical e-mail message makes holistic evaluation more fitting than attempting to judge separate qualities of a written piece. The impression concerns, basically, how well does the writer communicate the message to the reader, how well does language work for the task.

Methods and Procedures

The survey instrument, which was adapted from scales reported in the literature (Steinfield, 1983; Kinzie & Delcourt, 1991) and validated by a panel of experts, consisted of three major sections which served to measure variables of interest. Independent variables chosen for the study included: (a) attitudes towards e-mail technology, (b) patterns of e-mail use, and (c) demographic characteristics such as age, gender, number of years in teaching, rank, and number of years e-mail has been used. Holistic effectiveness ratings of e-mail communication served as the dependent variable.

In additional to questions on these three sections, those surveyed were asked if they would be willing to provide copies of e-mail messages that they had sent. The message analysis portion of the study employed two measurements: (a) a panel of six experts used a holistic rating scale to determine an effectiveness score for each document, and (b) the software computer program Grammatik 5 was used to determine a readability score for each document. A correlation matrix was generated to examine relationships among the variables.

Data Source

The population of interest was the teaching faculty at Virginia Polytechnic Institute and State University who have published e-mail addresses. From a total population of 1,400, a random sample of 500 faculty were sent a survey via campus mail. A follow-up survey was sent four weeks after the initial mailing to encourage further responses. A total of 301 surveys were returned, yielding an overall response rate of 60.2%. From this number, 262 were considered usable, giving an overall usable response rate of 52.4%. Initially, 43 respondents indicated they would send copies of e-mail messages for document analysis. A total of 33 individuals actually sent copies of messages. The messages of 30 individuals were long enough to be considered usable. The e-mail messages were sent electronically by the respondents to the researcher.

Results

E-mail messages were rated for communication effectiveness by a panel of experts, with a holistic score ranging from 4 for poor to 20 for excellent given to each message. The messages ranged in length from 50 words to 280 words, and ranged in purpose from an informal note to an acquaintance to a formal request for funding.

The six judges rated a total of 60 messages. The first three judges rated two messages from each of 15 respondents, while the second three judges rated two messages each from the other 15 respondents. A t-test was conducted to determine if the average scores of the first three judges differed from the average scores of the second three judges. The t-value was 1.73 with a probability of .199. Since the scores from both sets of judges were not significantly different, further analysis of messages was done as one subset.

In addition, a readability score for each of the messages was generated by the computer software program Grammatik. The lower the score, on a scale of 0 to 100, the more difficult the writing is to read. The scores for the 60 messages ranged from 30 to 89. The mean was 62.93, while the standard deviation was 17.25.

Since the sample subset that provided copies of e-mail messages was self-selected, it was deemed necessary to determine if the subset differed systematically from the total sample before any subset analysis could be conducted.
As the results of two sample t-tests, summarized in Table 1, indicate, the two groups differ significantly on the three independent variables under consideration. The mean for the e-mail use variable is greater for the subset, indicating more frequent e-mail use. The means for the attitude and self-efficacy variables are lower for the subset, indicating more positive attitudes and greater self-efficacy.

The two groups being different, the relationship, if any, that existed between the holistic writing scores, readability scores, and the independent variables, was examined through correlation procedures. As shown in Table 2, correlations between the dependent variable of holistic and readability scores and the independent variables is virtually non-existent.

Table 1

Results of T-Tests for Independent Variables for Total Sample and Writing Sample Subset

	Total Sample N=232		Subset N=30			
Variable	Mean	SD	Mean	SD	t-value	Prob. > t
E-mail Use	30.75	11.18	37.23	7.32	3.09	.0020
Efficacy	2.08	.78	1.56	.66	-3.45	.0006
Attitude	1.78	.72	1.31	.29	-3.56	.0004

Table 2

Pearson Correlations Between Holistic Ratings, Readability Scores, Attitudes Toward E-mail, Self-efficacy with E-mail, and E-mail Use[a]

Variables	Mean	S.D.	Holistic r value	Readability r value
E-mail use	37.23	7.32	0.07	0.02
Efficacy with E-mail	1.56	0.66	0.05	0.03
Attitudes toward E-mail	1.31	0.29	0.03	0.07
Holistic Scores	16.18	0.51	1.00	-0.41
Readability Scores	62.93	17.25	-0.41	1.00

[a]N = 30

The correlation for the independent variables with holistic scores ranges from .03 for attitudes toward e-mail to .07 for e-mail use. The correlations for the independent variables with readability scores ranges from .01 for e-mail use to .07 for attitudes toward e-mail. The correlation between the two dependent variables, holistic scores and readability scores is -.41, a low negative correlation (Hinkle, Wiersma, & Jurs, 1979). The correlation is expressed negatively because the scale for holistic effectiveness is the reverse (low to high) of the readability scale (high to low). Thus, the higher holistic ratings tended to be messages with ratings of greater reading difficulty.

The findings of the analyses used to answer the research questions, which were concerned with the relationship of holistic ratings of e-mail messages and e-mail use, attitudes, and demographics are offered as preliminary conclusions. They are based on responses from a sample of self-selected faculty who differed systematically from the rest of the sample group on all of the independent variables. Thus, the generalizability of any findings would be quite limited.

Conclusions

The results indicate that correlations between the dependent variable of holistic writing scores and the independent variables of attitudes toward e-mail, e-mail use, and demographics are virtually non-existent. Thus, it most likely would not be helpful for teachers to know levels of student attitudes for teaching various aspects of writing e-mail messages. A low negative correlation, -.41, was found between the holistic writing scores and the readability scores of the messages, with the more difficult to read messages receiving the higher holistic scores. Therefore, teachers may want to alert students that e-mail messages written at a too simplistic level may not be perceived as favorably by recipients as ones more carefully worded, especially in a professional environment.

Recommendations

If experience with e-mail is important, then instruction should involve as much hands-on application as possible. Conceptually, e-mail is fairly rudimentary; the difficulties are presented by the unfamiliar communication conventions and the often less-than-friendly user interface. Successful experience is the best way to overcome these difficulties. Another recommendation in this area would be to have teachers provide an e-mail address to students and to encourage students to communicate with them over this medium.

The wide range of holistic scores for communication effectiveness suggests that some individuals are more careful than others when composing e-mail messages. Instruction in e-mail communication should rely on the same fundamentals for good writing as any communication course in the curriculum. The fact that an e-mail message sent to a distribution list may be read by thousands of people should serve as added motivation for careful writing. The range of grade level for readability scores suggests that instruction in e-mail communication should recognize the range of formality appropriate for various written formats. For example, the minutes of an organization's annual meeting would be written at a higher level than an informal memo to a colleague. Along with an emphasis on modeling writing as it is done in the real world, by practicing professionals, instruction should not neglect the basics of good writing.

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A Foundational Skill: Composing at the Keyboard

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Since the typewriter was first invented in the 1860s, business educators have emphasized keyboarding as a skill used to prepare, in printed form, documents created by another. Keyboarding, thus, has been viewed as a low level, repetitive task (Wiggs, 1993). Advances in technology, shifts in workforce skills, and accelerated demands for up-to-date information presented in a variety of formats have resulted in an emerging need for keyboarding as an enabling skill--a tool used by almost every American working in all types of organizations and at every level in the hierarchy of those organizations (Toppe, 1991). Anderson-Yates and Wiggs (1993) when reporting on a study of document origination processes used by business professionals noted that these individuals anticipate in the next 2 to 3 years to communicate more through electronic mail, have less administrative support, and choose or are expected to prepare their own documents. Thus, keyboarding proficiency will become an essential job skill for these professionals. Further, Roderick (1987) noted that business executives are discovering that they can be more productive by keyboarding information at a computer terminal rather than dictating the same information to an administrative support person.

In addition, keyboarding skills are needed to perform telecommunications tasks (Taylor, 1989), which are rapidly becoming a key facet of work life in our global society. No one can question that keyboarding is a skill that is needed by all of today's workers; yet, many of today's workers fail to use their keyboarding skills effectively and to the fullest advantage. One way that workers can enhance their use of the keyboard is through the development of composing- at-the-computer-keyboard skills. Workers who compose at the keyboard will have a competitive productivity advantage over workers who write in longhand before keyboarding. To achieve this increased productivity goal, business educators must effectively teach students to compose at the keyboard.

The purpose of this research was to determine procedures that business teachers can use to teach composing-at-the-computer-keyboard skills. Little doubt exists that the nature of keyboarding skills used for both personal and work-related needs has changed. The major emphasis is no longer on keyboarding and formatting documents created by someone else; but, rather, today's emphasis is on composing and formatting documents created by the author, who is also the keyboardist. However, most keyboarding instruction still emphasizes typing from printed or rough-draft copy created by others.

Business teachers may well realize the need for teaching composing-at-the-computer-keyboard skills; however, no research base exists for them to determine how to do so effectively. This project will be an initial step in establishing guidelines for selecting and using instructional materials and procedures that do, indeed, work when teaching composing-at-the-computer-keyboard skills.

Objectives for the study included:

1. Evaluating the effectiveness of selected instructional procedures and materials when actually used with high school students.

2. Identifying and selecting instructional materials and procedures that can be used to teach composing-at-the-computer-keyboard skills.

METHODOLOGY

Initially, a search for materials and procedures available for teaching composing-at-the-computer-keyboard skills was completed. From the materials and procedures located, those appropriate for use with second semester high school keyboarding students were identified by the researchers, all of whom have had extensive experience in teaching keyboarding and completing research related to keyboarding. These materials SERVED AS THE BASIS FOR THE study materials. Approval for use of the materials for the research was cleared with authors and publishers as necessary. Further, if appropriate materials were not available, they were created, as needed, by the researchers.

In selecting the materials, care was taken to assure that progression followed a logical pattern from word, to phrase, to sentence, to paragraph level responses. These response stages are defined as follows:

Word-response level. At the word-response level, students are given questions that require a one-word response. One learning activity at this level requires that students respond to a question by keyboarding either a "yes" or "no" response. Students are instructed to keyboard the question, then to keyboard their response without hesitation. Another learning activity at the word response level requires students to keyboard a given word; and, without hesitation, keyboard its opposite.

Phrase-response level. At the phrase-response level, students receive a list of incomplete sentences. Students are then instructed to keyboard each incomplete sentence; and, without hesitating, keyboard two or more words that make the sentence complete and coherent.

Sentence-response level. At the sentence-response level, students receive a list of words. Students are then instructed to write or compose at the computer keyboard a complete, coherent sentence using each word on the list. Students are not allowed to write in longhand on paper before inputting information. Yet, students, if they wish, can combine words on the list to compose the sentences.

Paragraph-response level. At the paragraph-response level, students are instructed to write or compose a paragraph using an instructor-supplied topic sentence. Students are required to keyboard the topic sentence and, at the same time (without writing in longhand on paper), supply supporting sentences. Prior to assigning this activity, the instructor should use an example to illustrate the procedure with the class.

One school was identified for the study with three first semester keyboarding classes. Of the three classes, one used the materials with teacher guidance, one used the materials without teacher guidance, and in the third class, the teacher did not address composing-at-the-computer- keyboard skills except as they might occur incidentally in the text.

DATA COLLECTION

During the 1993 Spring Semester, 54 high school students enrolled in three Keyboarding I classes at one western Virginia high school participated in a research project to determine the effectiveness of these four instructional levels--word-response, phrase-response, sentence-response, and paragraph response--on learning to compose at the keyboard. During a five-week training period, one teacher exposed the students (grades 9-12) to each of the four instructional levels. The secondary teacher taught each instructional method for one week. During the one-week period for each instructional level, students progressed from lower level activities to more difficult activities using materials that the students had not seen previously. For example, on day one of the word-response instructional level, students listened to a statement or question read to them by the teacher. After listening to the teacher's question or statement, students were directed to keyboard an answer. As the week progressed, students were to keyboard a statement or question distributed by the teacher and then keyboard a response. By the fifth day of the instructional level, students were directed to keyboard their responses to the learning activities without hesitating. The scenario described above was repeated for each of the four instructional levels.

At the end of each day for each of the four instructional levels, the teacher collected the students' completed exercises. On a daily basis, the teacher reviewed the papers for spelling, punctuation, capitalization, and other errors normally reviewed or considered by keyboarding teachers. When the students progressed to writing complete sentences, spelling verifiers and grammar verifiers contained within WordPerfect 5.1 were used by the teacher to analyze the keyboarded exercise. Grammar verification included: total words, total sentences, total syllables, total words with three syllables, average words per sentence, and Fog index readability level.

FINDINGS

At the end of the four instructional levels, students who participated were able to compose sentences and essays at the keyboard without hesitating. Grammar verification mean scores from the last activity that the students composed at the keyboard follow.

MEAN SCORES FOR STUDENT ACHIEVEMENT AFTER COMPLETING COMPOSING AT THE KEYBOARD ACTIVITIES

	Teacher Guidance	With Teacher Guidance	No Emphasis
Total Words	75	78	72
Total Sentences	6.5	7.1	7.25
Total Paragraphs	2	2	2
Total Syllables	121	126	116
Total 3-Syllable Words	16.3	17.1	15.6
Average Words Per Sentence	11.5	10.9	9.9
Average Sentences Per Paragraph	3.25	3.55	3.625
Fog Index	10.7	11.8	10.875

Regardless of the instructional method used by the classroom teacher, with this limited sample, secondary school students were able to compose usable sentences to form an essay at the keyboard. Interestingly, the students who only had routine textbook exposure concerning composing at the computer keyboard were also able to compose effective sentences. Thus, it is likely that the ability to compose-at-the-computer-keyboard can be learned.

CONTRIBUTION TO BUSINESS EDUCATION

The challenge that business educators face is determining how to best use the keyboarding instructional time to help their students develop this basic foundation skill--composing-at-the-computer-keyboard. Thus, the nature of keyboarding instruction must change, particularly instruction beyond that required to teach students to use the keyboard by touch. One key change which will align keyboarding instruction with students' needs will be to place emphasis on teaching skills required to compose at the keyboard. This change in instructional emphasis will align what business educators are teaching in keyboarding with one of the basic skills emphasized in the three-part foundation of what workers need identified in the SCANS (Secretary's Commission on Achieving Necessary Skills) report (1991). "Writing," that basic skill, is described as preparing a worker who "communicates thoughts, ideas, information, and messages in writing; and creates documents such as letters, directions, manuals, reports, graphs, and flow charts" (p. xviii). The emphasis is on workers being able to do this on their own--not on their being able to process information created by others.

Business educators are confronted with an ever-changing curriculum. One of the major thrusts today is that they be able to reinforce and integrate academic skills into business offerings. Ability to compose well-written documents is an essential skill for students in both their future careers and their future personal lives. Thus, knowledge of how to teach composing-at- the-computer-keyboard skills effectively is essential to business education. The outcomes of this research will help business educators reinforce essential academic skills while at the same time provide students with an essential real-world skill.

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ELECTRONIC MAIL: PRIVACY AND ETHICAL ISSUES

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Introduction

With the increasing use of electronic mail, privacy and ethical questions have arisen for electronic mail users. Office users of E-mail and managers need to be aware of the privacy and ethical issues involved with communications technology. Few textbooks (business communications, office management, information systems, or other business courses) are covering privacy and ethical issues for electronic mail. Business instructors need to update their students on the privacy and confidentiality issues for using electronic mail in today's offices. This paper explores E-mail privacy and ethical issues for employees and employers. In addition, the study discusses electronic mail from the perspective of business educators.

Background

Casarez (1992) reported over 12 million E-mail users in 1991. An increasing number of firms are utilizing E-mail, in part because greater participation with Internet and the Information Superhighway. The E-mail messages most frequently are transmitted in the form of memos or letters.

Probably the most frequently reported concern of E-mail technology is privacy and confidentiality for the sender or author of E-mail messages. The ownership of electronic mail messages varies from state to state. Authorities are still debating whether electronic mail should be treated similarly to paper mail or telephone messages.

In business organizations and offices, the privacy issue has begun to surface. Does an employer (or supervisor) have the right to access, monitor, or read an employee's mail? Because employee E-mail messages are keyed in and transmitted on company-owned equipment, is the message the ownership of the employee or the employer? Even though employees access their company E-mail account with a secret password, many companies have monitored and read employee E-mail messages (Will Your Boss Read Your E-Mail, 1992; Kapor, 1992).

When E-mail messages are transmitted and stored via computer, those messages are vulnerable to access by others, whether legal or ethical, intentional or unintentional. Another privacy concern is that a letter or memo sent to one party may end up being copied and sent to others without the expectation or knowledge of the first author. Sometimes messages have been changed or modified by the person at the destination and then forwarded. Thus, the first author's words have been changed without his or her knowledge, but the first author's name appears as the sender. All of this is possible because only a few keystrokes are required to send and forward messages.

The legalities concerning electronic mail privacy remain fuzzy. State laws vary, and some of those laws are different for public and private sector workers. In addition to state laws regarding E-mail, the fourth amendment of the United States Constitution and the Electronic Communications Privacy Act are used in E-mail confidentiality discussions. With the increased use of E-mail, court cases are beginning to surface--usually as employees sue employers on the grounds of invasion of privacy when employers have read an employee's E-mail messages (Casarez, 1992; Will Your Boss Read Your E-Mail, 1992).

The information reported in this paper was derived from (1) a review of literature concerning E-mail ethical and privacy concerns and (2) a survey of E-mail privacy and ethical content coverage in business textbooks. This paper discusses the legal implications, E-mail policies, E-mail in education, and E-mail coverage in business communication textbooks.

Discussion

Legal Implications

Although telephone and letter messages are generally regarded as private, E-mail monitoring has generally favored employers ("Whose Office is This, 1993, p. 93). Casarez (1992, p. 38) points out that three sources of law may be used in determining the legality of E-mail monitoring: (1) federal and state statutes, (2) federal and state constitutional provisions, and (3) the common law.

The 1986 Electronic Communications Privacy Act (ECPA) is the only federal statute which covers E-mail monitoring. This act forbids "government agents and third parties from intercepting E-mail without the consent of one of the parties to the communication"; however, the ECPA does exclude electronic monitoring used in the ordinary course of business (Casarez, 1992, p. 38). Also, the ECPA permits electronic monitoring with the "express or implied consent of one of the parties to the conversation" (Casarez, 1992, p. 38). Thus, employers obtaining written consent from employees or by notifying employees in advance about monitoring

appears to be legal under the ECPA. Many states have statutes limiting the monitoring of oral and wire communications, but many do not appear to cover E-mail monitoring.

The fourth amendment of the U.S. Constitution prohibits unreasonable governmental searches and seizures; however, this protects public sector employees and not private sector employees. Casarez (1992, p. 38) found only two states, California and Louisiana, had constitutions which covered private sector employees.

With very little protection provided by either federal or state statutes, some employees use common law by claiming "invasion of privacy" by proving that the employer "intruded into the private affairs of the employee in a manner that would be highly offensive to a reasonable person" (Casarez, 1992, p. 38). Even to use the "invasion of privacy" argument, the employee would have to prove that he or she had a "reasonable expectation of privacy in his or her E-mail messages" (Casarez, 1992, p. 38); however, most employers have countered this invasion of privacy charge with "legitimate business interest" arguments. Jacobs (1994, February, p. 25) points out there is a difference between monitoring and snooping. If the electronic surveillance does not serve a legitimate business purpose, it may be considered "snooping" or an invasion of privacy.

Casarez (1992, p. 39) concludes that current laws favor the employers, but employee privacy issues will continue to be brought before the courts. She suggests that organizations can avoid costly lawsuits and improve employee relations by developing E-mail privacy policies.

E-Mail Policies for Employees and Organizations

In a Macworld magazine survey of 301 firms, over 70 percent had used some electronic eavesdropping at least once over a two-year period (Jacobs, 1994, February, p. 23). Many firms have no policies about E-mail. Some organizations such as General Motors, McDonnell Douglas, Warner Brothers, and Citibank, have adopted policies prohibiting the monitoring of employee E-mail messages. Others (Eastman Kodak, DuPont, and UPS) have policies indicating the right to monitor employee E-mail (Casarez, 1992, p. 39). With computer fraud by hackers or in-house employees, some employers feel they must have at least some monitoring of E-mail (Kapor, 1992, p. 288). A 1993 Macworld study found only 18 percent of companies had a written policy regarding electronic privacy, and only 31 percent of the companies monitoring employee computers, E-mail, or voice mail give employees advance warning (Piller, 1993, p. 123). Companies can communicate information or E-mail policies to employees via company communications (company memo or letter, employee handbook, or procedures manual) or as an on-screen statement each time the employee uses E-mail. Jacobs (1994, April, p. 24) suggests that some firms can create an alternative for employees by creating bulletin boards for employees to use for sending personal messages.

Many employees are not aware that E-mail messages may be monitored. Bayless & Irvine (1994, p. 2) suggest that employees assume E-mail privacy because they have a private password. Employers have the resources to override passwords. Also, employees may assume (erroneously) that E-mail is afforded the same protection as a first-class letter.

E-Mail in Education

Many papers and articles are written in both business and education periodicals about E-mail, Internet, or the information superhighway. Business educators, especially teachers of business communication, are quickly utilizing E-mail and Internet for teaching purposes. At the 1994 Annual Convention of the Association for Business Communication, a survey of program session titles indicated that 19 (8 percent) of the 238 conference session titles included words of "E-mail," "electronic mail," "Internet," or "Information Highway." This survey of ABC program session titles did not include more inclusive terms of "telecommunications" which may have discussed E-mail issues.

Few authors discuss privacy with E-mail coverage. Bayless & Irvine (1994, p. 2) summarized seven E-mail concepts for business educators, one of which was about ethics and privacy issues relating to E-mail. These authors stated that ethical issues are involved in the composition and etiquette of the message and sender--not just in the sending of messages.

E-Mail Coverage in Business Communication Textbooks

In the past decade, business communication textbooks have added E-mail to the discussion of technology in communication. In 1994, Peeples, Morse, & Bialac surveyed the E-mail coverage of 15 college business communication textbooks published between 1992 and 1994. All of the 15 textbooks had at least one or more pages for the terms *E-mail, electronic mail,* or *E-mail messages*. Most of the textbooks discussed E-mail, facsimile mail, or databases in general theoretical terms, but only one-third provided examples of E-mail messages. Of the textbooks providing examples, some focused more on the software format and appearance rather than the E-mail message itself.

For this paper, the authors surveyed the 15 business communication textbooks used in the Peeples, Morse, & Bialac study (1994); however, the 1992 textbooks were replaced with 1995 editions. This survey sought to determine whether privacy or confidentiality issues of E-mail were discussed in the 15 business communication textbooks, all published from 1993 through 1995.

Based on the results of this 1995 survey, very few business communication textbooks are adding privacy or confidentiality issues with their discussion of E-mail. Of the 15 textbooks, only five (33.3 percent) discussed privacy or confidentiality issues in regard to E-mail messages. Four of the five textbooks discussed at least in some detail outside monitoring of E-mail; one textbook gave only passing reference to "privacy." Although it could be assumed that the latest editions would be more prone to cover confidentiality, four of the five textbooks covering confidentiality were published in 1994; only one was published in 1995. Other 1995 editions did not cover confidentiality in their E-mail coverage. As an example, of confidentiality or privacy in a business communication textbook, Vik & Gilsdorf (1994) gave the following warnings to users:

- If you wouldn't way something in a business meeting, don't say it in an electronic message.

- Normal workplace rules of conduct apply: Don't libel or slander others, even public figures, don't make comments of a sexual, racial, or ethnic nature; don't use company time to socialize with other employees or plan nonwork activities.

- Because the computers are furnished by the firm for company use, the firm has the right to review and control this use.

- Political petitions, ethnic jokes, chain letters, activities for individual financial gain, and inappropriate disclosure of company information are prohibited in E-mail just as they are in other office activities. (p. 54)

Conclusions

Based on the review of the literature and the survey of business communication statements, the following conclusions are presented:

1. Most individuals or employees regard their E-mail messages as their property, and thus, consider it unethical for others (including their employers) to access their messages without their knowledge.

2. Many employees are unaware of the potential (or legalities) for others to access, read, or monitor their E-mail messages.

3. Employers tend to consider E-mail messages the property of the organization, although many have not had a problem with privacy issues and have given little thought about employee E-mail confidentiality.

4. Most recent court cases have ruled in favor of employers over employees regarding electronic mail privacy. Employers can monitor electronic mail legally by obtaining consent or by giving advance notice. In cases where firms had not obtained consent, monitoring was permitted for legitimate business purposes.

5. Few organizations have an official E-mail privacy policy, and an even smaller number have informed their employees of existing E-mail privacy policies.

6. Only one-third of the business communication textbooks surveyed covered E-mail privacy or confidentiality issues.

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THE EFFECT OF STRUCTURED TECHNIQUES ON GROUP DECISION MAKING IN THE UNDERGRADUATE BUSINESS COMMUNICATION CLASSROOM

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Introduction

The popularity of collaborative writing groups continues to increase both in business and in the classroom. There is a growing need for employees who can work effectively and make decisions in groups. Thus, business communication educators must create classroom situations where students learn to work together effectively on assigned tasks. Increasing group decision-making effectiveness requires more than just throwing students together with their classmates with little or no guidance or preparation. Bruffee (1984) stated, "to do that is merely to perpetuate, perhaps even aggravate, the many possible negative efforts of peer group influence: conformity, anti-intellectualism, intimidation, and leveling-down of quality" (p. 652).

To avoid these problems and to develop appropriate group skills, educators must include structured group techniques as part of the educational program. Which techniques have the most applicability in the business communication classroom? Which techniques will produce the highest quality document as well as the most favorable student reaction? The application of structured group decision-making techniques in the business communication classroom requires research to test their usefulness for improving collaborative writing.

The purpose of this study was to determine which, if any, of four structured group techniques--reverse brainstorming (RB), dialectical inquiry (DI), devil's advocacy (DA), or consensus (C)--can best improve the functioning of decision-making groups in the undergraduate business communication classroom as assessed by quality of written document and student reaction. Also, the effects of gender, age, and academic intellectual ability on quality of written document and student reaction to the decision-making technique were investigated.

Group and Individual Learning

Advantages of small groups include interaction and the pooling of differing abilities which can motivate group members to solve problems they could not have solved as effectively alone. Many research studies have reported the positive impact of group learning on student achievement, social relationships, motivation to learn, and attitude (Slavin, 1985; Sharan & Shaulov, 1990; Lazarowitz & Karsenty, 1990).

After an extensive review of group research, Shaw (1981) concluded that group decisions are generally more accurate and groups usually produce more and better solutions to problems. In addition, the related literature shows that groups tend to learn faster than individuals and group activities facilitate learning.

Group Decision-Making Techniques

Group learning may be the solution to the practical problems of large classes. More importantly, the review of related literature provides a theoretical framework that, in general, shows that group work in the classroom tends to result in improved student achievement and performance, social relationships, motivation to learn, and attitudes. Researchers reported that educators may want to structure conflict into the learning group to increase students' involvement in learning, to guard against groupthink, and to increase motivation. Consensus (C) is often used as a group decision-making technique; however, this technique does not formally structure conflict into the group and is designed to elicit a more open, less critical discussion (Schweiger & Sandberg, 1989). This more open, less critical discussion characteristic can make the consensus technique susceptible to groupthink. As suggested in the literature, dialectal inquiry (DI), devil's advocacy (DA), and reverse brainstorming (RB) decision-making techniques structure conflict into the group process (Johnson & Johnson, 1991; Rothwell, 1992; Schweiger & Sandberg, 1989).

Devil's Advocacy (DA) structures conflict into the decision-making process. The role of the devil's advocate is to introduce dissent to avoid reaching a premature and potentially erroneous consensus. The devil's advocate challenges assumptions and broadens the range of alternatives which are considered (Schweiger & Sandberg, 1989).

Advantages of the DA technique include the criticism of assumptions and solutions. A disadvantage is the destructive attitude present in the technique. The group member whose idea was criticized and rejected may develop a negative attitude and only produce safe solutions. Another disadvantage of the DA technique is the fact that no new plan is suggested to replace the rejected one (Mason, 1969).

Dialectical Inquiry (DI) is a group-forming technique that will produce the most divergent solutions to a given problem. This technique involves separating decision makers into subgroups. One of the subgroups will identify the assumptions upon which the original recommendation is based and develop an alternative recommendation (Schweiger & Sandberg, 1989).

An advantage of the DI technique is that the plan is confronted and a new plan is developed through structured debate. The effectiveness of the DI technique in strategic planning has been supported by the research (Mason, 1969; Mitroff & Emshoff, 1979). In contrast, the DI technique has been criticized because sources of the plan and counterplan are not clearly identified and thus may result in misintrepretation of this technique (Chanin & Shapiro, 1985).

Reverse Brainstorming (RB) is similar to brainstorming in that the technique is also concerned with generating ideas but not for solving a problem. Instead, the ideas are criticisms of previously generated solutions. Negative rather than positive features of ideas are sought (VanGundy, 1984).

Strengths of the RB technique include the amount of discussion used for each idea and the search for ways to overcome weaknesses in the alternatives. However, this technique may create a negative climate and be time consuming (VanGundy, 1984).

Based on the review of related literature, it is difficult to determine which decision techniques are the best to use. Although the DI technique appears to produce the lowest quality decisions in classroom settings, this technique has proven to be successful in other settings. Therefore, no clear patterns have emerged. Schweiger and Finger (1984), as well as other researchers, have suggested that future research compare DI and DA to other types of group decision-making structures, such as consensus.

Quality of Written Document

Writing in groups in the classroom has a positive impact on many areas of writing such as peer group editing, peer tutoring, peer criticism, and peer evaluation as well as a significant positive effect on the quality of student writing (Clifford, 1981; O'Donnell, 1985, 1987; Bruffee, 1984, 1986; Burnett, 1990; Lunsford & Ede, 1986). Therefore, quality of written document served as a dependent variable in this study.

Students need to participate in the group process by challenging and questioning their own ideas (Burnett, 1990; Bruffee, 1984). Just assigning students to groups does not guarantee that this participation takes place. Burnett (1990) suggested that students need a structure to help them question and assess the quality of their products. The four decision-making techniques (RB, DI, DA, and C) studied in this research provide structure to the group process and should improve the quality of written document.

Student Reaction

Another important dependent variable in this study as well as in the classroom is student reaction to a group technique. Levine and Moreland (1990) and Shaw (1976, 1981) stated that a major factor in the success of a group is group cohesion. Members of a cohesive group are more likely to participate in group activities, to stay in the group, and to avoid disrupting the group (Levine & Moreland, 1990).

Group cohesion can be influenced by conflict; as conflict increases, group cohesion can decrease resulting in a less successful group experience (Nelson & Smith, 1990; Shaw, 1976, 1981). Nelson and Smith (1990) reported that dissatisfaction with assigned roles in the group may cause

conflict. Therefore, the conflict incorporated into the DA and DI techniques and the impact of conflict on a group's success may be causes for concern when these techniques are used in the classroom.

When using the consensus technique, Miller (1989) found that groups feel more confident about their decisions and are more satisfied with their decisions as well as with their groups. However, Rothwell (1992) suggested that using the consensus technique is time consuming and can produce tension within the group which some members can perceive negatively. Similarly, VanGundy (1984) pointed out that the RB technique focused on the negative aspects of group solutions. It appears that the C and RB techniques may receive negative reaction from students as well.

Gender, Age, and Academic Intellectual Ability

In recent years, gender has received attention in the literature as a possible factor influencing group performance (Acker, 1990; Baird, 1976; Bradley, 1980). Shaw (1981) concluded that men and women behave differently in groups and these behavioral differences impact group processes. Men are traditionally expected to be aggressive, assertive, and task-oriented; females are usually supposed to be passive, nurturing, and person-oriented. In many situations, females are more conforming than males. Specifically, gender behavioral differences may have an influence on the quality of written documents and the student reactions produced by the techniques.

Age has been a neglected variable in group studies. Obviously, persons of different ages behave differently. Much research has been done using children as subjects, but the literature review revealed little work done with college-age students (Shaw, 1981). Two studies were found involving college-age students and adults. Both studies pointed out that age can be a significant variable not only in children's groups but in adult groups as well (Bass, Wurster, Doll, & Clair, 1953; Chaubey, 1974).

Although groups are usually better at solving problems than the average individual, groups are seldom better than the best individual (Schweiger & Sandberg, 1989). Therefore, groups generally perform better if they are composed of individuals who achieve higher scores on measures of academic intellectual ability (Olmsted & Hare, 1978). Also, the review of literature indicated that the more intellectually capable the individual, the more active and less conforming in groups he or she will be (Shaw, 1981).

In a study by Williams and Sternberg (1988), an attempt was made to determine if social and intellectual styles of group members could predict the quality of the group performance. The results showed that individuals do not perform as well as groups and that intellectual styles can predict group performance. Thus, academic intellectual ability appears to influence group processes.

Method

The sample for this study consisted of 120 undergraduate students enrolled in four sections of a junior-senior level business communication course. Each experimental and control group consisted of four randomly assigned students. Six groups were used in each experimental

decision-making technique--RB, DI, DA, and C--and six groups were used as control groups. Sixty-four males and 56 females participated in the study.

This study used a factorial experimental design with two independent variables and two dependent variables. One independent variable, decision-making technique, contained four treatment groups and the control group. The other independent variable was gender. The two dependent variables were quality of written document and student reaction to the decision-making technique. An analytical memorandum report written by the students and rated by business communication experts and a self-reporting questionnaire, Student Reaction Questionnaire, were used to determine the treatment effect on the dependent variable. Data for two extraneous variables, age and academic intellectual ability, were collected by administering the Wonderlic Personnel Test. Subjects in this study ranged in age from 19 to 40 years and scored between 9 and 33 on the Wonderlic Personnel Test. This factorial design used a two-way multivariate analysis of variance.

To determine the quality of each item on the Student Reaction Questionnaire, an item analysis was conducted on each of the 18 items appearing on the instrument. Next, principle factor analysis was used to test the construct validity of the items on the Student Reaction Questionnaire. Kaiser's Measure of Sampling Adequacy was also used to test the items on the Student Reaction Questionnarie and eigenvalues were calculated. Thus, the Student Reaction Questionnaire was analyzed statistically through item and principle factor analyses to determine its validity and reliablility. Fifteen of the original 18 items were used to interpret the findings of this study.

The extraneous variables of students' age and academic intellectual ability were compared statistically to the two dependent variables, student reaction and quality of written document, to test for a correlation of .20 or higher.

A multivariate analysis of variance was used to determine if (a) a significant difference existed among the structured group decision-making techniques and the quality of written document and student reaction; (b) a significant difference existed between females and males on the quality of written document and student reaction; and (c) an interaction existed between decision-making technique and gender. Finally, an analysis of variance was performed on the differences between Factors 1 and 2 of the Student Reaction Questionnaire and the two independent variables.

Results and Conclusions

Factor 1 of the Student Reaction Questionnaire (manipulation checks) was significant at the .05 level and involves the criticism of the ideas and recommendations developed within the groups. Specifically, Items 11 through 15, 17, and 18 asked students to comment on their level of agreement or disagreement as to whether or not two drafts of the report were created and then criticized by other group members.

As shown in Table 1, the control groups were significantly different in that students disagreed that their groups used debate and criticism of subgroups' ideas and recommendations. The control groups differed significantly from the DA ($p < .0002$), DI ($p < .0001$), and RB ($p < .0004$) groups. Control groups did not differ significantly from the C groups. Similarly, the C groups differed significantly from the DA ($p < .0002$), DI ($p < .0001$), and RB ($p < .0003$)

groups. Also, a significant difference existed between the DI and RB ($p < .0506$) groups. This difference suggests that the DI groups used more debate and criticism than the RB groups. The test for least square means revealed that students in the control and C groups tended to disagree more strongly with Items 11 through 15, 17, and 18 regarding the debate and adversarial tone of their decision-making technique.

Factor 2 of the Student Reaction Questionnaire (student reaction) was not significant. Therefore, student reaction to a technique may not be an issue when using these techniques in the undergraduate business communication classroom.

The test for differences using least square means revealed that control groups performed significantly better at the .05 level on the quality of written document than C ($p < .0061$), DA ($p < .0157$), DI ($p < .0001$), and RB ($p < .0040$) groups. The least square means score for control groups was 7.31 on the ten-point rating scale. The C ($p < .0011$), DA ($p < .0005$), and RB ($p < .0018$) groups did significantly better than DI groups on quality of written document with mean scores of 5.67, 5.84, and 5.83 respectively (Table 2).

Table 1

Probability of Significant Differences Among the Least Square Means for Factor 1 of the Student Reaction Questionnaire

Group	Least Square Mean	Standard Error LS Mean	Probability > [T] HO:LS Mean (i) = LS Mean(j)** i/j	1	2	3	4	5
Control	33.1399	1.9040	1	.	.9427	.0002*	.0001*	.0004*
Consensus	33.3333	1.8973	2		.	.0002*	.0001*	.0003*
Devil's Advocacy	22.6778	1.9595	3			.	.0909	.8105
Dialectical Inquiry	17.9928	1.9242	4				.	.0506*
Reverse Brainstorming	23.3333	1.8973	5					.

*p < .05

**i = rows; j = columns

Table 2

Probability of Significant Differences Among the Least Square Means for Quality of Written Document

Group	Least Square Mean	Standard Error LS Mean	Probability > [T] HO:LS Mean (i) = LS Mean(j)** i/j	1	2	3	4	5
Control	7.3147	.4174	1	.	.0061*	.0157*	.0001*	.0040*
Consensus	5.6667	.4160	2		.	.7668	.0011*	.8876
Devil's Advocacy	5.8444	.4296	3			.	.0005*	.6632
Dialectical Inquiry	3.6857	.4219	4				.	.0018*
Reverse Brainstorming	5.5833	.4160	5					.

*p < .05

**i = rows; j = columns

In summary, the control groups produced the highest scores on the quality of written document. C, DA, and RB groups produced the next highest scores on the quality of written document. DI groups did not perform as well and produced the lowest scores on the quality of written document.

Implications

The results of the present study imply that the levels of debate and criticism present in the structured decision-making techniques are characteristics that differentiate the RB, DI, and DA groups from the control and C groups. Factor 1 of the Student Reaction Questionnaire was significant which suggests that debate and critical evaluation appear to be present in the RB, DI, and DA techniques and not present in the control or C techniques. These results indicate that business communication educators should evaluate their objectives for using a particular structured group technique. If the task requires the generation and criticism of many alternatives, then RB, DI, or DA may be the appropriate structured group technique to use in the business communication classroom.

The results of the test for significant differences between Factor 2 (Student Reaction) and the structured decision-making technique were not significant. These results imply that student reaction may not be an issue when using these structured techniques in the business communication classroom. For example, educators' concern about the tension generated by the RB, DI, and DA techniques was not supported by the present research. Similarly, concerns about the negative attitudes students may develop relative to the techniques and their groups were not supported by this research. Since the debate and criticism of other group members' ideas are structured into the techniques, students may believe that they have been given permission to be adversarial. Therefore, business communication educators should not be concerned with student reaction to a particular technique. Also, these structured group techniques should be considered in classrooms with culturally diverse students. The structure provided in these techniques may encourage more participation from all members of a group.

The control groups produced written documents that were of a significantly higher quality than the groups using the RB, DI, DA, and C techniques, possibly because students may be more accustomed to using the traditional instruction involved in the control group. DA, RB, and C groups produced the next highest scores on the quality of written document. These results imply that the DI technique should be avoided as a decision-making technique in the business communication classroom when the quality of written document is an objective.

Business communication educators should consider training students in the RB, DA, and C techniques before using them in the classroom. Training in the DI technique may also improve results; however, the DI technique may be appropriate only when the objective of the group assignment is to generate and evaluate many assumptions and recommendations. This technique may be more applicable to assignments which involve many complex issues.

The other independent variable, gender, did not have an effect on the quality of written document or student reaction. In addition, no significant interaction existed between decision-making technique and gender. Finally, age and academic intellectual ability did not correlate significantly with the dependent variables. These results imply that business communication educators do not need to assign students to groups by gender, age, or academic intellectual ability. In fact, when

using these structured group techniques in the business communication classroom, random assignment of groups is recommended. Also, concerns over women's acceptance of the adversarial tone of the RB, DI, and DA techniques appear to be unfounded.

Recommendations for Further Study

The following research concerns arising from this study merit further investigation:

1. A study to determine if significant differences would exist among the independent and dependent variables in this study if participation in structured decision-making groups were extended. Will students become better at using the different decision-making techniques after using them for one month, eight weeks, or a full semester? Will students become more concerned with the adversarial tone of the DI, DA, and RB techniques after using these techniques for a longer time period? According to Schweiger, Sandberg, and Ragan (1986), DI and DA techniques leave members less committed to group decisions and less willing to work again with their group.

2. A study to determine the effect of learning styles or personality types on the use of decision-making techniques and the quality of written document and student reaction. Certain learning styles and personality types may not adapt well to the adversarial tones of the RB, DI, and DA techniques.

3. A study to determine if significant differences would exist among the various decision-making techniques and the quality of written document and student reaction if students were trained in the use of the techniques. Providing instruction to students before utilizing these techniques may change the results.

4. A study using the same treatment as described in this experiment be conducted with secondary students to determine if these techniques could be used in secondary classrooms. Secondary students may need more structure in their group projects and may find these structured techniques helpful.

5. A study using the design as described in this study with actual decision-making teams from the work force to determine which techniques produce the highest quality written document and what effect these techniques would have on work force reaction. In addition, the extraneous variables of age and academic intellectual ability of those engaged in the work force may have some effect on quality of written document and reaction to the decision-making techniques that was not present in undergraduate classrooms.

6. A study to determine if significant differences would exist among the independent and dependent variables in this study if culturally diverse subjects were used. Would these structured decision-making techniques encourage more participation from culturally diverse group members?

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Analysis of Content and Research Design in the Delta Pi Epsilon Journal and the NABTE Review

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Introduction

"Professional journals serve as the bedrock of a profession" (Cook, 1983, p. 94). Cook explains further that "journals can serve as gatekeepers to the kinds of knowledge and information disseminated" (p. 94). If one accepts this responsibility as appropriate for professional journals, it would appear reasonable, then, to periodically analyze the content, research design, and authorship of articles published to determine the extent to which they have been responsive to changes in both research topics and design.

This idea of periodic review and analysis of journal publications is not new. Pelsma and Cesari (1989) conducted a content analysis of the Journal of Counseling and Development. As these authors note, "The Journal is a living history of the issues confronting the profession" (p. 275). In fact, analyses of authorship and affiliation have appeared in the NABTE Review (1988). Thomas (1983) analyzed business education research articles in the Delta Pi Epsilon Journal and the NABTE Review from 1977-1981. He used a modified topical classification system developed earlier by Ober (1982).

Purpose

The purpose of this research project was to determine the status of articles published in the Delta Pi Epsilon Journal and the NABTE Review. The following questions were asked:

1. What is the authorship of the articles?
2. What is the author affiliation?
3. What research design was used?
4. What evidence is there of efforts to address futuristic research design and topics?

Method

The content analysis research method was used in this study to analyze business education manuscripts. Berelson (1952) in Borg and Gall (1989) stated that "Content analysis is a research technique for the objective, systematic, and quantitative description of the manifest content of communication" (p. 519). Borg & Gall (1989) provides these further steps in content analysis:

1. specifying objectives
2. locating relevant data
3. gathering contextual evidence
4. developing a data samping plan
4. developing coding procedures

5. planning analysis procedures

As the purpose of this study was to describe the research reported in the Delta Pi Epsilon Journal and the NABTE Review publications since their inception, content analysis was an appropriate methodology. Every volume for each publication was available for review. The Delta Pi Epsilon Journal began publication in 1957; all 36 volumes through 1994 were analyzed. The NABTE Review began publication in 1973; all 22 volumes through 1994 were analyzed.

A coding sheet was developed which listed journal, publication year, volume, issue number, author affiliation, and type of research. After this data were noted, the specific college/university affiliation was noted as was the theme of the article. After all the journals were reviewed, each article was classified. The classification system used was a modified version of Thomas' (1983) classification of Delta Pi Epsilon Journal and NABTE Review articles. Additions were made to that list to reflect research topics since 1983. Absolute frequencies and percentages are reported for all these categories. The following are the categories used in this study:

Accounting	Office Education
Business Administration	Shorthand
Business Communication	Status of Women/Gender issues
Curriculum Development	Teacher Education
Economics & Basic Business	Technology
Evaluation	Tests & Measurement
Guidance & Personnel	Typing
History of Business Ed.	Word/Information Processing
Keyboarding	Other

Findings

A total of 488 Delta Pi Epsilon Journal articles and 288 NABTE Review articles were reviewed. The following sections address the research problem and four questions which arose from the research problem.

Authorship and Affiliation A total of 535 authors were represented in the Delta Pi Epsilon Journal, and 337 authors were represented in the NABTE Review. Because of multiple authorship, the number of authors exceeds the number of articles reviewed for each journal. For each publication, the vast majority of authors, 79% and 92.3% respectively were college/university faculty members. There was representation from junior/community colleges, technical institutes, high schools, graduate students, and "others" on Delta Pi Epsilon Journal articles. The "other" category here, 11.8%, included the DPE Distinguished Lecture authors. The NABTE Review, however, had additional representation from only junior/community colleges, high schools, and "others" as shown in Table 1.

Authors from 181 colleges/universities were represented in the Delta Pi Epsilon Journal and from 129 colleges/universities in the NABTE Review. Every college/university with which any author was affiliated was listed alphabetically. A tally was then made for authors from each institution. In the Delta Pi Epsilon Journal, the vast majority of institutions, 89.62% (N=164), had author ownership on four or fewer articles. The remaining 19 colleges/universities accounted

for 10.38% of author citation. In the NABTE Review, 116 or 89.23% of the institutions had author ownership on four or fewer articles. The remaining 14 colleges/universities accounted for 10.77% of author citation. Table 2 details this affiliation.

Research Design Of the 776 articles analyzed, 62.9% (N=488) were in the Delta Pi Epsilon Journal, and 37.1% (N=288) were in the NABTE Review. The topics of Evaluation, Office Education, Teacher Education, and Other categories comprised 43.24% of the articles in the Delta Pi Epsilon Journal. The topics of Curriculum Development, Evaluation, and Teacher Education comprised 50% of the articles in the NABTE Review. Table 3 presents the entire analyses for all 18 topics for both journals.

The themes included in the Evaluation topic included program and student evaluation, accountability, ratings of effectiveness, and analysis of research. Curriculum Development included such topics as mastery learning, business education at the secondary level, programmed instruction, and special needs students. Teacher education included teaching methods, effective teaching, certification, and professional development.

Those themes generating the fewest number of articles were Business Administration, History of Business Education, Status of Women/Gender Issues, Guidance & Personnel, Keyboarding, and Technology. Both themes of Typing and Keyboarding were used for several reasons. First, not only has the terminology changed, but the meanings of these words have also changed. Second, using both made it possible to better track their use in the research literature in an effort to determine if a concommitant change in use had taken place.

The research design for these articles was also determined. The following topics closely paralleled those used by Thomas (1983):

Causal-comparative	Experimental
Confirmatory	Exploratory
Corelational	Improvement-oriented
Critical Incident	Predictive
Description	Qualitative
Discussion	

It is important to note that "Discussion" clearly implies only that and not a research-based report. In the early volumes of both these publications, a number of such articles were published authored by "leaders" in Business Education.

As is evidenced by Table 4, most articles fell into either the descriptive or discussion categories, Delta Pi Epsilon Journal, 62.7%, NABTE Review, 83.3%. Those following a more complex statistical analysis were more likely to be published in the Delta Pi Epsilon Journal. Only one qualitative article was published in either journal. It is also worth noting that in Volume 23, 1981, of the Delta Pi Epsilon Journal, an article **about** qualitative research design appeared. A similar article appeared in the NABTE Review in 1992.

Futuristic Design and Topics There is little or no evidence to embrace new research methods such as the qualitative design. In addition, no evidence surfaced in the content analysis to support

any research topic that might be termed "futuristic." In fact, an article published in the Delta Pi Epsilon Journal volume 35, 1993, compared using the personal computer with the typewriter to teach keyboarding. Indeed, from 1990 to about 1993 there were a number of articles making this same kind of comparison. And as late at 1988 another article in the Delta Pi Epsilon Journal analyzed errors made by shorthand writers.

Discussion The content analysis of these business education publications provided a comprehensive analysis of content and research design. This analysis revealed that the most frequent topics for research were teacher education, curriculum development, evaluation, and office education.

While these topics were frequently and thoroughly addressed, it is interesting to note that into the early 1990s authors continued to compare using a personal computer to a typewriter. Computer technology has affected few disciplines more directly than business education; yet, based on this analysis, there appears to be an unwillingness to fully and quickly embrace new technology. This is even more of a concern as keyboarding is a means to many ends, not an end in itself.

Nor was much variation determined in research design. While an article in each of these journals talked **about** qualitative research, only one article was published which used that design. Qualitative research is not new and does provide an opportunity to gather a rich kind of information that is simply not obtainable via a quantitative route.

Recommendation Based on this content and research design analysis, the following recommendations are made:

1. Conduct a similar comparison but break it down in five-year intervals. This would enable one to determine where a particular topic or research design was either used or discontinued.

2. Develop a more current classification for research topics. This would be useful for all involved in research in business education.

3. Encourage the editorial boards of the Delta Pi Epsilon Journal and the NABTE Review to seek out qualitative research articles relevant to business education.

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Table 1
Author Affiliation

	Delta Pi Epsilon Journal		NABTE Review	
	N	%	N	%
College/University	423	79.0	311	92.3
Junior/Community College	21	3.9	7	2.1
Technical Institute	3	.6	-0-	-0-
High School	18	3.4	5	1.5
Graduate Student	7	1.3	-0-	-0-
Other	63	11.8	14	4.1
Total	535	100.0	337	100.0

Table 2
College/University Affiliation and Authorship

	Delta Pi Epsilon Journal	
	N	%
One author citation	103	56.28
Two author citation	35	19.13
Three author citation	13	7.10
Four author citation	13	7.10
Five author citation	5	2.73
Brigham Young University		
Illinois State University		
North Texas State University		
Temple University		
University of Houston		
Six author citation	3	1.64
Cleveland State University		
New York University		
University of Tennessee, Knoxville		
Seven author citation	3	1.64
Arizona State University		
CUNY		
Michigan State University		
Nine author citation	2	1.09
Baruch College, CUNY		
Michigan State University		
Eleven author citation	2	1.09
Northern Illinois University		
Virginia Polytechnic Institute		
Twelve author citation	2	1.09
Utah State University		
University of Minnesota		

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Table 3
Content Analysis for Delta Pi Epsilon Journal & NABTE Review

	Delta Pi Epsilon Journal		NABTE Review	
	N	%	N	%
Accounting	30	6.15	4	1.39
Business Administration	5	1.02	-0-	-0-
Business Communication	40	8.20	21	7.29
Curriculum Development	41	8.40	55	19.10
Economics & Basic Business	27	5.53	5	1.74
Evaluation	58	11.89	35	12.15
Guidance & Personnel	16	3.28	14	4.86
History of Business Education	11	2.25	-0-	-0-
Keyboarding	18	3.69	4	1.39
Office Education	51	10.45	16	5.56
Shorthand	27	5.53	10	3.47
Status of Women/Gender	10	2.05	6	2.08
Teacher Education	53	10.86	54	18.75
Technology	6	1.23	2	.69
Tests & Measurement	2	.41	5	1.74
Typing	32	6.56	9	3.13
Word/Information Processing	12	2.46	20	6.94
Other	49	10.04	28	9.72
Total	488	100.00	288	100.00

Table 4
Research Design

	Delta Pi Epsilon Journal		NABTE Review	
	N	%	N	%
Causal-comparative	70	14.3	22	7.6
Confirmatory	3	.6	-0-	-0-
Corelational	34	6.9	13	4.5
Critical Incident	9	1.8	-0-	-0-
Description	170	34.8	127	44.1
Discussion	136	27.9	113	39.2
Experimental	28	5.7	10	3.5
Exploratory	17	3.5	1	.4
Improvement-oriented	2	.4	-0-	-0-
Predictive	18	3.9	2	.7
Qualitative	1	.2	-0-	-0-
Total	488	100.0	288	100.0

Twenty author citation Ball State University	1	.55
Twenty-one author citation Southern Illinois University	1	.55
Total	183	100.00

Table 2
Author Affiliation

	NABTE Review N	 %
One author citation	75	57.69
Two author citation	21	16.15
Three author citation	12	9.23
Four author citation	8	6.15
Five author citation Louisiana Tech Weber State University	2	1.54
Six author citation Cleveland State University New York University University of Minnesota	3	2.31
Seven author citation Ball State University University of Georgia University of Missouri, Columbia	3	2.31
Eight author citation UCLA	1	.76
Nine author citation Southern Illinois University Southwest Missouri State	2	1.54
Thirteen author citation Virginia Polytechnic Institute	1	.76
Eighteen author citation Arizona State University	1	.76
Twenty author citation Utah State University	1	.76
Total	130	100.00

The Effect of Experience on Financial Causal Knowledge in Auditing

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In the present study three groups of students with different levels of experience were tested on their financial causal knowledge. Subjects were supposed to answer ten questions which varied in difficulty and were based upon financial relationships in a financial statement. Results confirmed our expectations that when experience increases, so does the application of financial causal knowledge. Especially, the experienced students answered the more complex questions significantly better than the less experienced students did. Thus, it may be concluded that experienced auditing students have a better organized and more complex financial knowledge network than less experienced auditing students.

Introduction

One of the main goals in business education is to prepare students effectively for their later business career. Over the last few years a growing number of business schools tries to innovate and improve curricula in order to make a well-matched fit between the educational program and practice. For example, Milter and Stinson (1995) describe several capabilities students should have acquired, when they enter practice. For instance, they claim that graduated students should not only have acquired knowledge, but they should also be able to apply prior knowledge.

Yet, in several domains it has been demonstrated that students often fail to apply domain knowledge to related tasks. The failure to apply domain knowledge in specific tasks appears to be related to the structure of that knowledge. For instance, Chi, Feltovich & Glaser (1981) demonstrated that the domain knowledge of experienced physicists was organized on the basis of relations between concepts and underlying abstract physics principles, whereas novices' knowledge was organized on the basis of surface features. These results showed that only the expert physicists integrated relations between concepts with conditions of application of these concepts. Particularly the combination of declarative knowledge (relations between concepts) and the procedural knowledge (conditions of application) should be associated with successful problem solving. Moreover, experts are able to match externally presented things and internal models of these things very quickly (Chi et al., 1981).

Regarding these findings in physics, we conducted a study in which the relationship between level of experience and organization and application of financial knowledge in auditing was examined

(Vaatstra, Boshuizen & Schmidt, 1995). In that study, subjects of four levels of experience participated: fourth-year auditing students; postgraduate students who had previously followed the auditing curriculum at the university of Limburg and had about six months of experience in practice; postgraduate Nivra[1] students who had followed the part-time Nivra program and had an average of five years of practical experience and experienced auditors who had on average twelve years of experience. Subjects had to think aloud while they went through two financial statements of contractor firms. Afterwards, they had to mention all audit issues that would need special attention during the audit process. We were especially interested in the question as to how the subjects dealt with the financial information and which concepts were related with each other. For this, we examined not only the number of financial concepts, but also the type of relations between the financial concepts subjects used.

Results indicated that graduate students and postgraduate university students with less than a year of practical experience hardly tried to relate financial concepts with each other. The few relations between concepts that were mentioned by these rather inexperienced students were mostly based upon concepts which had been presented close to each other. That is, either both concepts were situated in the balance sheet or both concepts were presented in the profit-and-loss account. Contrary to these inexperienced students, postgraduate Nivra students and experienced auditors related a large number of financial concepts with each other. Especially, concepts which had been situated far apart were often related with each other. For example, the experienced subjects related concepts from the balance sheet with concepts from the profit-and-loss account and with concepts from the general account. Moreover, the experienced subjects not only related separate financial concepts, but they also used the descriptive organizational information of the company to interpret the financial information (Vaatstra et al, 1995).

Thus, the more experienced Nivra students and the experienced auditors seem to have a better organized knowledge network and appear to know better how to apply their financial knowledge in comparison with the less experienced groups. So, despite the fact that the fourth year students and the postgraduate university students with about six months of practical experience had successfully completed all relevant financial courses as Bookkeeping, Financial Accounting and Financial Information Systems, they hardly use this financial knowledge in an auditing task like financial statement analysis.

In the present paper, a follow-up study is presented in which it is examined if the relationship between level of experience and application of prior financial knowledge will be found again when auditing students are confronted with direct questions about specific causal relationships in a financial statement. With this study we try to find answers on the following questions: First, is there a positive relationship between experience and the number of causal relations between financial concepts. Second, we expect to find qualitative differences between the groups when the questions differ in complexity. That is, the more experience a student has, the better (s)he answers on questions about more complex relationships. On the other hand, there might be a smaller difference between the experienced and inexperienced groups when the relationship is somewhat less complex.

Method

Subjects

Subjects of three levels of experience participated in this study: 25 fourth year graduate students majored in auditing; 29 postgraduate university students with an average of one and a half year of experience. These postgraduate students majored in auditing had attended the university graduate program before they entered practice. The third group consisted of 22 postgraduate Nivra students with an average of seven years of experience. These postgraduate Nivra students were graduated at the Nivra institute.
The postgraduate university students and the postgraduate Nivra students followed the postgraduate program at the University of Limburg or at the University of Amsterdam. Postgraduate university and Nivra students enter the postgraduate program at the same time and can be assumed to have a similar level of theoretical knowledge. Yet, the two groups differ largely in practical knowledge, since university students have one and a half year of experience and Nivra students have seven years of experience.

Material

The stimulus material consisted of a financial statement of a contractor firm which was used in a prior experiment (see Vaatstra et al., 1995). The test contained ten questions which were based on relationships between concepts expressed by experienced auditors in the think aloud study (Vaatstra et al., 1995). Questions and answers were restated by an expert in Bookkeeping and Financial Information Systems. According to this expert the test could be categorized in easy and difficult questions. Easy questions required answers which had been presented in textbooks and/or consisted of a rather simple underlying network. For example the question: "How is it possible that there is a negative investment in 1990?"

The answer to a difficult question is not directly available in a textbook and requires a complex underlying financial knowledge network. A difficult question was for example: "Describe the relationship between changes in Working Capital compared to changes in the Turnover?"

Procedure

Subjects took the test at home. We gave the subjects two instructions: first, they were asked to answer the questions as extensive as possible and second, the questions concerned this specific case.

Time necessary to finish the test was approximately an hour and subjects received a small compensation for their participation. After the test, some demographic facts were asked and there was an evaluation of the test.

Analysis

For all questions, the correct answers consisted of several correct parts. The more correct concepts a subject applied, the higher score (s)he received. The maximum score subjects could receive per question was ten, so the overall maximum was 100. Two persons coded the data,

of whom one was unknown with the hypotheses that were stated. For final analysis of the data, the average score of the two encoders was taken. Data were analyzed by means of analysis of variance and Scheffé's F-test. Scheffé F-test was used to compare specific group differences.

Results

First, there is a sufficient correlation of .73 between the two encoders.
In Table 1, it is shown that there is a significant difference between the three groups of students on the total scores, $\underline{F}$ (2,73) = 19.08, $\underline{p}$ < .0001.

Table 1

Average Scores and Standard Deviations

	Total	Easy	Difficult
Graduate	28,5 (10,6)	15,4 (5,4)	12,8 (7,4)
Postgraduate university	37,9 (10,1)	20,2 (7,2)	17,5 (6,4)
Postgraduate Nivra	45,2 (5,8)	21,6 (3,8)	23,3 (5,1)

* between parenthesis is the standard deviation

Differences between the groups on easy and difficult questions are also depicted in Table 1, F (2,73) = 19.73, p < .0001. No differences were found between the easy and difficult questions, F(1,8) = 2.27, p< .14. Neither was there a significant interaction between group and type of question,
F(2,73) = 2.37, p< .11.

Table 2 summarizes Scheffé's comparisons between the concerned groups on total, easy and difficult test scores. As is shown all groups differed significantly from each other on the total score. On the easy questions, Scheffé's F-test indicated that fourth year students differed significantly from both the postgraduate university students and the postgraduate Nivra students. There was however no significant difference on the easy questions between the postgraduate groups. Regarding the results on the difficult questions, all group comparisons showed significant differences.

Conclusion and Discussion

The results show that the more experienced groups have higher scores on the test, indicating that these experienced students do not only have more financial concepts available in memory, but they also have a financial knowledge network that is better organized.

Table 2

Mean Differences and Scheffé's Comparisons

	Mean difference (Scheffé F-test)	Mean difference (Scheffé F-test)	Mean difference (Scheffé F-test)
4th year versus post university	-9.4 (6.86)*	-4.8 (4.7)*	-4.8 (3.7)*
4th year versus post Nivra	-16.6 (18.8)*	-6.2 (6.8)*	-10.6 (15.8)*
post university versus post Nivra	-7.3 (3.8)*	-1.4 (0.4)	-5.8 (5.1)*

* Significant at 95%

Furthermore, the expectations about the relationship between differences in experience and qualitative differences in the applications of financial knowledge were confirmed. That is, when the questions became more complex, experienced Nivra students gave qualitatively better answers than the less experienced subjects. The differences between the groups were somewhat smaller on the relatively easy questions.

Yet, a finding which was somewhat surprising, were the relatively low scores by all subjects on this reasoning test. The maximum total score that could be reached was 100 points, whereas the highest score attained was 55,5. These rather disappointing scores could bring up the idea that financial knowledge might not be important for the auditing practice. Yet, the evaluative questionnaire with questions about students' opinion on analysis of financial statements demonstrate the opposite. The question concerned, was: "What do you think when a course, comparable to this financial statement task, would be given in the auditing graduate program"? Subjects could answer on a Likert scale varying from unimportant to very important and were also asked to explain their answer. As is demonstrated in Table 3, all groups think it is quite important to receive a course comparable to this financial statement task. The answers of fourth year students indicate that these students think it is somewhat more important to receive a similar course than the postgraduate university students and postgraduate Nivra students.

Table 3

Means and Standard Deviation on Question About Relevance of Task.

	What do you think when a course, comparable to this financial statement task, would be given in the auditing graduate program ?
fourth year students	4.3 (0.75)*
postgraduate university students	4.1 (0.76)
postgraduate nivra students	3.96 (0.93)

1 = unimportant;2 = more or less important;3 = no meaning;4 = important;
5 = very important; * = standard deviation.

The explanation almost every participating subjects gave, was that this financial application task is absolutely important to prepare them for the auditing practice. An additional answer that was given by fourth year students was that they thought it was a pity, they had not been given the opportunity to attend such a course in the curriculum. They were convinced that if there had been more training on the interpretation of financial information in an auditing context, they might have performed better on this test. So, although all subjects knew financial knowledge is important for practice, they were not able to demonstrate their knowledge in this particular test.

A plausible reason for the relatively low scores on this knowledge test might be that the students were not used to the manner in which they were supposed to answer. After all, we asked them to answer as extensive as possible, while students normally have to give just one answer. For instance, students usually have to answer a question like: "How is it possible that there is a negative investment in 1990?" with the answer " there are more disinvestments than investments in assets". In the present test, in order to receive the maximum ten points, students also had to give the answers: "fixed assets have been sold"; " current floating assets have decreased" and finally "financial assets have decreased". Hence, the answers had to be more specific and extensive than in the usual tests and that probably has had its influence on the relatively low scores of the test. The results on the test support this conjecture, most subjects answered all questions just partly.

A final explanation for the relatively low scores could be that even the Nivra students do not have such a perfect refined network, they can answer all question perfectly.

Although all students scored relatively low on the test, graduate students performed somewhat better on this direct assessment than on the prior think aloud study (Vaatstra et al., 1995). What

could be the explanation for that? One possible reason might be that graduate students do not recognize the importance of financial relationships in an auditing context when they do not receive a hint. When graduate students are directly asked about the relevance of financial information for the auditing practice, they are likely to answer that financial analysis is very important for the auditing practice (see Table 3). Yet, to spontaneously apply financial knowledge in an auditing task is another thing. Probably, students never learned how to apply and integrate their financial knowledge in an auditing case. In the previous study (Vaatstra et al., 1995), some graduate students remarked that they thought they had to mention internal control issues and no financial misstatements. Since they never had attended a course in which they had to apply financial knowledge to the audit of a company, students were not aware of the fact that they also had to mention financial issues when they were asked for important audit issues. Thus, although graduate students know financial misstatements are important for the auditing practice, they do have some difficulty in applying their financial knowledge unprompted to an audit task.

So what has to be done in the future, in order to prepare students well for practice, is to develop an integrated course about the application of financial knowledge in the audit environment.

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